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A SIMPLIFIED NUTRITION PROGRAM FOR THE LATTER HALF OF LIFE

CLIVE M. McCAY, Ph.D.*

Cornell University, Ithaca, N. Y.

One of the most influential articles ever written in the field of nutrition was a long letter by a London undertaker who had become so fat by the age of 60 that he was obliged to descend stairs backwards and could not even tie his own shoe laces. This undertaker was William Banting (1797–1878). His famous "Letter of Corpulency" appeared in 1864. If this letter had never appeared the writer would have been destined for oblivion like hundreds of contemporary undertakers. Instead, Banting became famous because he presented in simple language a way to regain health by reducing his diet in carbohydrates and fats. This lucid letter influenced thousands, although it has been somewhat forgotten today. However, one collection of Banting letters and news items was offered recently for sale in a New York shop at a price of eight hundred dollars.

The Banting experiences are familiar to every physician. Large numbers of such human tragedies appear daily. In this late period of life for the overweight person some measure of health can be restored but one always wonders how much more could have been achieved if the body had never been allowed to become too fat.

During the past few days, two intelligent men have come to our laboratory with their stories because both have come to believe in the important part nutrition plays in their well being. Both men were formerly overweight but not as fat as Banting. Both are men who paid little attention to nutrition because they were in such superb health until they reached 50 years of age. Both have now reduced to thin bodies after great efforts.

Both of these men are scientists and well read in their fields. The first, who is now 60, had long suffered from overweight and constipation. Not until he broke a bone and was bedridden for many weeks did he really reduce his body weight and become so interested in nutrition that he is now almost a faddist. Before the breaking of the bone, he had long known of research indicating that milk is the most effective food for the maintenance of strong bones in old age but he had never drunk milk because he disliked the taste. Now he has learned that his breakfast of 15 prunes with the juice mixed with a pint of milk is very pleasing in taste. The rest of his breakfast consists of two slices of whole wheat bread without butter, and black coffee. Unfortunately, he still, on the basis of taste, does not drink his coffee mixed with hot milk. However, his constipation has disappeared, his feeling of well being has returned and he believes he faces a healthy future.

Nothing that this man is doing is new. The knowledge of nutrition that he is applying was well established more than a hundred years ago. Already in 1708

* Professor of Nutrition.

the famous Boerhaave (1668–1738) was teaching his patients to omit laxatives and eat apples and plums. Likewise, the value of milk in old age is well illustrated in some ancient paintings in which old men are shown being kept alive, like infants, at the breasts of young women.

Most modern research indicates that milk is the most important single food for people during the latter half of life.

The second nutrition enthusiast to visit us recently was also overweight until he, like Banting, arrived at the age of 60 about twelve years ago. His physician then discovered that he was a diabetic. After a number of internists had failed to impress upon this engineer the importance of reducing and watching his food intake, one succeeded. This success was the result of teaching the patient nutrition in terms of slices of bread and patties of butter supplemented with vitamins in the form of yeast and wheat germ.

Too many of us professional nutritionists probably try to present our knowledge in the complexities of calories and milligrams of vitamins and minerals. This engineer had learned because his physician had reduced all to equivalents in terms of slices of bread and pieces of butter. He had learned that a potato of a given size eaten at noon meant that he should eat less bread, and that a piece of fried food meant an equal reduction in butter.

Such lists of equivalents are now available from several sources (1, 2).

For more than a century, foods have been evaluated in terms of calories but this teaching seems too complex for many people to remember. Many excellent works concerning the control of body weight are now available (3, 4, 5).

For a quarter of a century basic studies with experimental animals of short life span, such as white rats, have indicated that the onset of many of the diseases of old age is much delayed if the animal is obliged to keep its body thin (6). For half a century since the studies in Ehrlich's laboratory by Moreschi (7), it has been recognized that even the development of tumors is delayed in the thin bodies of animals such as mice.

Studies are now beginning to appear from various parts of the world indicating that the most productive cows result from heifer calves that are reared upon restricted calorie diets that allow slow growth but prevent fattening. Likewise studies are now beginning to appear indicating that under certain conditions it may be more economical in meat production to retard the growth of beef steers for substantial periods of time. In some cases these periods may last as long as six months.

Accumulating evidence indicates that rapid growth may not insure optimum health throughout life. Certainly most evidence indicates the virtues of a thin body during adult life.

A new series of experiments has just been completed at Cornell but not published. In earlier research (8), it was found that white rats could live throughout the whole of life upon a diet of cow's milk supplemented with small amounts of trace minerals and cod liver oil. The trace minerals were copper, manganese, iron and iodine.

Rats fed upon such diets were found to have a normal span of life. When

they died in old age, they were found to have stronger bones than controls, and teeth without decay.

In order to determine if this superior state of the teeth were due to some inherent property of milk or to the liquid nature of the diet, a new series of experiments was run in which large groups of rats were fed as follows:

(a) liquid milk diet supplemented with trace elements and cod liver oil
(b) diet "(a)" but rats were allowed free access to solid sucrose
(c) diet "(a)" with sucrose dissolved in the milk
(d) diet "(a)" with rats having free access to a 10 per cent solution of sucrose.

No decayed teeth were found in rats in groups (a) and (c), whereas a substantial amount of decay occurred in the other two groups. This seems to indicate that milk can protect teeth against the action of sucrose when the sucrose is dissolved in the milk, but cannot do so when the sucrose is consumed separately, as it might be in a solid form such as candy, or a liquid form such as a soft drink.

The unique result of the foregoing study in a consideration of corpulency, however, was that the rats fed milk containing dissolved sucrose were excessively fat from very early in life until they died in old age. These rats had a shorter life span than those in any other group.

This result again establishes the relationship between excess body fat and a shortened span of life. It has another interest, however, since it affords a simple experimental technique for keeping animals overweight for any fraction of the life span and then studying the effects of forced reduction at various stages of life. Thus one has an experimental method for answering the common question of how much health can still be salvaged from a body long subjected to stresses resulting from overweight. In other words a partial answer may be gained to the common question of whether or not one may just as well allow very old people to continue to indulge in food after they have done so for the most of life.

Enthusiasts for the use of modern nutritional knowledge often call attention to the marvelous advances made in basic knowledge, such as the chemical structure of the vitamins. They feel that there should be more evidence of equal advances in applying this knowledge to improvement of health of older people.

The whole history of medicine indicates that basic knowledge must often accumulate for centuries before it can be used effectively, because the body of knowledge is often too incomplete to permit application. Thus, although physiology, pharmacology and biochemistry advanced rapidly in the sixteenth and seventeenth centuries, various forms of blood-letting based upon false premises were widely used in medicine until about a century ago. Garrison notes (9) that France imported forty-one million leeches in 1833 and that as many as fifty leeches might be used to draw the blood from one patient. Today it would be hard to find a record of such imports, which must be negligible. Statistical study of the effectiveness or failure of treatments ultimately ended the use of leeches which had never been sanctioned by the results of experimental science.

Part of the application of nutritional knowledge in old age today may be as futile as the use of leeches but we have few statistical attempts to sort out the useful from the futile. Animal research guides us, but lacks conclusiveness for application to man.

Throughout history ignorance has played an important part in preventing men from using established knowledge. It is commonly believed today that improved communications have led to greatly increased knowledge from the printed page, from the radio and from television. There is substantial doubt if these means of communication have led to increased knowledge of truth in nutrition.

These same means of communication are used to spread partial truths or stimulate practices such as excessive use of alcohol or sugar. Furthermore, there is great competition among the many producers of substances eaten by man to capture the consumers' money. Hence a given industry may often spread some form of sophistry to increase the sale of a given foodstuff which may be directly opposed to the interests of the health of an older person or any person.

Therefore, in order to select foodstuffs intelligently it is important that reliable nutrition education be available to everyone, so that sound discrimination is possible.

Two movements are afoot in our nation today that may have profound influences upon the health and nutrition of people in later life. The first of these is the limitation of potentially harmful chemicals that can be put into foods and the second is the increase in the sale of food products of known composition. Both of these advances are being both opposed and supported by various segments of food industries.

The first problem, namely, the use of large numbers of new chemicals in foods has resulted from the growth of knowledge, especially in the field of organic chemistry. Numerous new chemicals have found their way into foods, either to control some factor such as the staling of bread or to control insect pests in some original product such as stored wheat.

The interest of the public has led to a closer scrutiny of many chemicals used in food. Some that have long been permitted, such as coumarin and certain dyestuffs, have now been prohibited due to modern evidence. Switzerland has had a law prohibiting the use of chemicals in foods without sanction of the highest authority, for more than fifty years. Thus, today Swiss flour and bread contain none of the common additives. Due partly to the influence of the Delaney Committee there is much interest in both England and in Europe in this problem and England is improving her outmoded laws.

In protecting himself, the only opportunity to the older person is to learn all he can about additions to food and refuse to buy any that contain questionable chemicals.

The second problem that permits more intelligent action is the support of foodstuffs of known composition. Thus throughout New York State and adjoining areas today bread of excellent nutritive value is being sold. The wrappers of this bread state the amounts of important constituents such as dry milk that were used in making it. These "open formula" foods are bound to lead to better nutrition because they stimulate the use of valuable recognized products. Secret, closed formulas for basic foods such as bread or cakes tend to produce products of lower nutritive value, since high-value products such as dried milk or eggs

are usually the more expensive, and these are decreased when closed, secret formulas are used.

As people grow older, they need to make every calorie count and see that every calorie carries its share of minerals, vitamins and protein. Hence, few older people can afford to indulge in excess sugar, alcohol, deteriorated cereals or fat. "A calorie is known by the company it keeps."

Even the lowest incomes in modern America permit the older person to select and eat an adequate diet. Such selection, however, requires a knowledge of foods and nutrition, and self discipline in regard to tastes, as well as amounts consumed.

SUMMARY

Advances in the basic science of nutrition are inevitably far ahead of the applications, because not enough variables are understood. Although a reservoir of knowledge that can be applied has accumulated for several centuries, this knowledge is poorly used by those living in the latter half of life. Three modern advances promise to simplify the usefulness of nutrition science, namely, 1) the formulation of teaching in simpler terms in the form of "exchange lists," 2) the increased action of public agencies against the introduction of useless or harmful chemicals into foods, and 3) the statement on labels of basic foods such as bread, of the composition in terms of amounts of ingredients. Although modern media of communication such as printing, the radio and television have spread nutrition information more widely, much of the benefit from such education has been offset by the simultaneous spread of partial truths and sophistry. The nutritional status of every person lies largely in his own hands during the latter half of life and depends largely upon his ability to curb his intake of such common foods as sugar, alcohol, low-grade cereals and many fats, as well as his ability to select foods of high nutritional value.

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HYPOGLYCEMIA IN RELATION TO DUODENAL ULCER*

L. CLAGETT BECK, M.D.

Straub Clinic, Honolulu, Hawaii

The purpose of this survey is to observe the incidence of hypoglycemia in duodenal ulcer, with emphasis on the relationship to hyperacidity.

Previous observers have noted apparent relationships between hyperinsulinism, hypoglycemia and duodenal ulcer. Seale Harris (1) was the first to stimulate interest in this field with his studies on hyperinsulinism in 1905, when he demonstrated that hyperinsulinism as manifested by hypoglycemia could produce the symptoms of peptic ulcer. In 1945, Abrahamson (2) studied the glucose tolerance curves of 16 patients with peptic ulcer. He observed symptoms of hypoglycemia when there was a marked drop in the blood sugar level to 70 mg. or less per 100 cc. at the end of the second or third hour of the test. Furthermore, he reaffirmed the relationship between hypoglycemia and hyperinsulinism by noting the rarity of peptic ulcers in diabetic patients. However, when peptic ulcer did develop in such a patient, he found that the glucose tolerance curve manifested a marked drop below the fasting level over a period of four to six hours, in spite of the early rise to hyperglycemia levels. Thus these diabetic patients manifested a delayed insulin response of the "dysinsulin" type described by Joslin.

Peskin (3) noted a symptom complex mimicking peptic ulcer which could be produced by only moderate reductions below the fasting blood sugar levels during a glucose tolerance test. This reaction was promptly reversed by orange juice. At no time could roentgen-ray evidence of peptic ulcer be found in his cases, although severe symptoms of postprandial abdominal pain were produced when the blood sugar level dropped as low as 74 mg. per 100 cc., and moderate symptoms with levels no lower than 88 mg. per 100 cc. Peskin believes we should not consider the concentration of fasting blood sugar to be the normal physiologic condition. Instead he believes that a blood sugar level of about 140 mg. per 100 cc. comes closer to being physiologically normal, since most of the time there is some food substance being metabolized or absorbed into the blood stream. Thus the concentration of blood sugar should be considered in relationship to its drop from such a level, rather than from that of the fasting state.

In 1945, Dragstedt (4) popularized the revival of the vagotomy operation for the treatment of peptic ulcer. The principle of this procedure depends upon the complete severance of all fibers of the vagus nerve, which reduces the motility of the gastro-intestinal tract and also removes the source of the stimulus which causes the parietal cells of the stomach to produce hydrochloric acid. The insulin test of Hollander (5) was devised for determining the completeness of the di-

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vision of all the fibers of the vagus nerve. By his method, sufficient insulin was given the vagotomized patient to reduce the blood sugar level to 50 mg. per 100 cc. or less. In non-vagotomized patients with free hydrochloric acid in the gastric contents, or in those in whom vagotomy was not complete, hydrochloric acid would then be found in the gastric contents. However, if no free hydrochloric acid were found following such insulin stimulation by hypoglycemia, it was evident that the division of the vagus fibers had been complete.

CLINICAL MATERIAL AND METHODS

A series of 96 patients was studied to ascertain if there might be a greater incidence of hypoglycemia (as observed in the glucose tolerance curve) among patients with roentgenologically proven duodenal ulcer and therefore with a greater increase in free hydrochloric acid, than among a similar group of patients in whom no duodenal ulcer could be roentgenologically demonstrated. Each patient in this series had symptoms or physical findings, or both, which justified a complete gastro-intestinal study in order to confirm the diagnosis of duodenal ulcer. Patients who had any of these studies for any other reasons were not included in this series. Among the non-ulcer group, diagnoses included pylorospasm, prolapsed redundant gastric mucosa, anorexia nervosa, relapsing pancreatitis, hypertrophic gastric, cholecystitis and cholelithiasis—all conditions which could and did mimic duodenal ulcer. In addition to the routine history, physical examination and standard laboratory procedures, each case had additional laboratory studies. First, there was a complete upper gastro-intestinal x-ray study, including fluoroscopy. Chemical gastric analyses were made on each patient by the method devised by Fennel (6), which is similar to the method subsequently advocated by Hollander (7) in which gastric acidity is recorded in units of pH. By this one method, concentration of acid rather than volume of acid is determined. Whenever achlorhydria was encountered, the patient was given a subcutaneous injection of histamine. The pH value of the gastric secretions thus obtained was recorded. Glucose tolerance tests were performed in each case by determinations of the blood sugar, fasting, and at the end of one-half hour, two hours and four hours after the ingestion of 50 grams glucose and water.

RESULTS

This series of 96 patients was divided into two main groups: 1) those with roentgenologically proven duodenal ulcer, and 2) those with other gastro-intestinal disease in whom no roentgenologic diagnosis of duodenal ulcer could be made. Abrahamson's (2) criterion of hypoglycemia (70 mg. per 100 cc. as the level of blood sugar in the glucose tolerance test) was used as the dividing line for determining the hypoglycemia level. Both of these groups were subdivided, according to the glucose tolerance curve, into those patients who did *not* show a marked drop in the blood sugar level to 70 mg./100 cc. or less and those who *did* show such a drop. One minor division comprised those patients with achlorhydria following stimulation by histamine.

Forty-seven cases of duodenal ulcer were encountered in this series of 96 patients. Twenty-four (51 per cent) of this group at one time or another had blood sugar levels of 70 mg. per 100 cc. or less. Of the remaining 49 patients, only 5 were encountered with blood sugar levels of 70 mg. or less during the glucose tolerance test. However, among this group of 49 were 9 patients who had had no free hydrochloric acid following histamine stimulation. Thus with 40 patients as a control in the non-ulcer group, 5 (12.5 per cent) demonstrated hypoglycemia by these criteria, whereas in the group of 9 patients who showed no free hydrochloric acid after histamine stimulation, there were no instances of hypoglycemia by these standards.

It will be noted in Tables 1, 2 and 3 that the two groups (duodenal ulcer group and non-ulcer group) were relatively comparable as to age, racial distribution and general body habitus as observed on general examination. There was a general preponderance of the asthenic types of individual in the whole series, with a relatively equal distribution in the two groups.

In reviewing all of the 29 patients in whom hypoglycemia was evident, the highest pH value of 1.8 was encountered in only 2 patients, and a pH value of 1.4 was seen only once. All the rest of the hypoglycemic patients had pH levels of 1.2 or lower. At the other extreme, there were no instances of hypoglycemia in any of the 9 patients with achlorhydria. In 5 non-ulcer cases with hypoglycemia, it is interesting that in every instance, there was a pH value of 1.2. In each of these patients there was a diagnosis of marked pylorospasm. In reviewing their histories, the symptoms in each of these 5 mimicked the duodenal ulcer symptom complex.

An attempt to control hypoglycemia is an important factor in the management of duodenal ulcer. The use of high-fat diets and frequent feedings has given place to the high-protein diet in the management of this type of hypoglycemia, on the basis of the physiologic principle that amino acids are about 50 per cent converted to glucose. Peskin's (3) patients responded best to a diet high in protein and high in fat. Bruger (8) and others have emphasized that when proteins and amino acids are partially converted to glucose, their absorption and metabolism requires four to four and one-half hours. This is in marked contrast to carbohydrates which require only about one and one-half hours, and to fats which require a similarly short period of time. Protein therefore tends to have a marked leveling effect on the glucose tolerance curve, because the insulin which is stimulated by the initial phase can react with slowly metabolizing glucose over a period of four to four and one-half hours.

In this series, patients with duodenal ulcer, as well as non-ulcer patients with hypoglycemia, were given diets calculated to contain 1.5 Gm. of protein for each Kg. of body weight according to the nutrient requirements of McLester (9), the important point being that protein was divided evenly among the three main meals, supplemented with protein supplement mixtures.

The following two diet supplements were most generally used:

1. A preparation containing in each 100 grams—protein, 50 Gm.; carbohydrate derived from cane, milk, grain sugars and soybean, 20 Gm.; calcium, 600 mg.;

TABLE 1. *Forty-seven cases of duodenal ulcer (proved by x-ray examination) with free HCl*

Nat.	Wt. (lbs.)	Age (yrs.)	Sex	Habitus*	Series No.	Initials	pH (chem.) gastric contents	Glucose tolerance test (blood sugar, mg./100 cc.)			
								Fasting	½ hr.	2 hrs.	4 hrs.
A. *Twenty-three cases without hypoglycemia*											
P.R.	120	22	M	A	1	A.C.	1.2	100	139	86	92
Jap.	132	20	M	A	2	S.E.	1.2	132	194	112	118
Cauc.	153	45	M	A	3	P.B.	1.2	122	194	78	92
Cauc.	135	30	F	N	4	M.F.	1.2	90	160	92	84
Cauc.	130	50	F	N	5	L.D.	1.2	122	160	102	80
Cauc.	103	44	F	A	6	A.M.	1.2	95	148	95	81
Cauc.	134	45	F	A	7	R.R.	1.2	97	198	75	84
Cauc.	150	45	M	P	8	M.B.	1.2	103	200	100	97
Port.	165	37	M	N	9	A.T.	1.2	106	143	86	95
Port.	130	35	M	A	10	A.M.	1.2	103	125	78	88
Port.	153	58	F	P	11	I.G.	1.2	112	168	132	86
Jap.	115	43	M	A	12	C.T.	1.2	98	178	97	94
Cauc.	143	33	F	P	13	E.S.	1.2**	97	163	115	86
Chin.	108	39	F	A	14	V.C.	1.2	100	116	88	78
Chin.	136	28	M	N	15	H.Y.	1.2	86	136	96	76
Port.	72	12	F	A	16	L.M.	1.2	98	96	93	98
Cauc.	113	31	F	A	17	C.P.	1.2	102	129	87	92
Cauc.	119	37	M	A	18	R.G.	1.2	123	150	89	98
Chin.	150	45	M	A	19	A.C.	1.2	117	162	96	102
Cauc.	162	54	M	P	20	Z.F.	1.2	102	158	113	92
Cauc.	177	31	M	A	21	M.O.	1.2	105	151	74	105
Jap.	118	39	M	A	22	I.I.	3.0	103	162	97	92
Cauc.	158	75	M	A	23	F.C.	1.2	94	143	97	100
B. *Twenty-four cases with hypoglycemia*											
Chin.	102	24	F	A	24	A.K.	1.2	84	183	194	*68*
Chin.	98	29	F	A	25	G.Z.	1.2	94	194	155	64
Chin.	165	33	M	N	26	K.C.	1.2	122	200	*64*	94
Cauc.	117	52	F	A	27	M.H.	1.8	94	130	*60*	75
Chin.	120	39	M	P	28	H.C.	1.8	106	109	*66*	100
Cauc.	153	45	M	N	29	A.A.	1.2	88	160	*66*	76
Chin.	107	25	F	A	30	H.L.	1.2	112	132	128	*70*
Port.	180	35	M	P	31	W.K.	1.2	96	153	*70*	92
Port.	160	30	M	N	32	J.S.	1.2	112	183	*70*	97
Jap.	80	12	M	A	33	W.M.	1.2	76	160	*60*	78
Chin.	96	30	M	A	34	M.C.	1.2	97	143	178	*59*
Port.	138	49	F	N	35	A.F.	1.2	94	158	86	*68*
Cauc.	175	63	M	N	36	J.K.	1.2	95	136	*60*	*68*
Cauc.	141	59	M	A	37	V.D.	1.2	*62*	112	86	80
Cauc.	133	56	M	A	38	C.O.	1.2	96	115	*67*	100
Cauc.	139	45	M	A	39	C.D.	1.2	96	123	*70*	94
Port.	110	27	F	A	40	G.B.	1.0	96	117	*70*	98
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Jap.	105	23	F	A	46	M.L.	1.4	86	155	*70*	108
Cauc.	120	31	F	N	47	F.H.	1.2	102	160	*59*	102

* A. Asthenic = 30 cases = 63%.
N. Normal = 10 cases = 22%.
P. Pyknic = 7 cases = 15%.

** Fasting achlorhydria prior to histamine stimulation.

TABLE 2. *Forty cases of non-duodenal ulcer with free HCl*

Nat.	Wt. (lbs.)	Age (yrs.)	Sex	Habitus*	Series No.	Initials	pH (chem.) gastric contents	Glucose tolerance test (blood sugar, mg./100 cc.)			
								Fasting	½ hr.	2 hrs.	4 hrs.
A. *Thirty-five cases without hypoglycemia*											
Chin.	166	27	M	N	48	G.L.	1.2	105	194	106	80
Jap.	141	25	M	N	49	J.S.	1.2	109	143	118	86
Jap.	102	30	F	A	50	J.F.	1.2	97	160	143	78
Jap.	91	19	F	A	51	C.K.	1.2	93	98	102	74
Jap.	106	38	F	A	52	V.Y.	3.5	103	168	103	76
Chin.	100	26	M	A	53	H.L.	1.2	96	200	88	81
Jap.	107	23	F	A	54	K.O.	1.2	103	164	115	84
Cauc.	125	33	F	N	55	M.G.	1.6	109	116	106	82
Cauc.	108	44	F	A	56	M.C.	1.2**	98	139	73	92
Cauc.	148	40	M	A	57	F.L.	1.4	103	152	87	88
Cauc.	104	29	F	A	58	M.H.	1.2	96	113	93	75
Cauc.	111	41	F	A	59	E.F.	1.2	92	125	108	81
Port.	145	25	M	N	60	D.P.	2.0	108	143	88	81
Cauc.	136	43	F	P	61	D.R.	1.2	100	139	84	77
Cauc.	117	35	F	N	62	M.H.	1.2**	86	153	77	88
Jap.	131	28	M	N	63	I.F.	5.6	95	168	103	77
Cauc.	164	42	M	A	64	B.H.	1.2	109	190	192	81
Port.	170	30	M	N	65	R.S.	1.2	100	164	139	73
Cauc.	153	40	M	N	66	J.F.	1.2	96	178	103	84
Cauc.	165	56	F	N	67	G.S.	1.8**	95	118	100	95
Cauc.	136	45	M	A	68	G.M.	1.2**	95	122	80	93
Cauc.	112	55	F	A	69	E.D.	1.6	80	117	90	81
Cauc.	140	44	F	N	70	D.F.	1.2	93	115	88	78
Kor.	114	28	M	A	71	I.G.	1.2	93	139	103	86
Cauc.	176	40	M	N	72	H.G.	4.0	88	152	139	76
Cauc.	165	39	M	P	73	T.O.	2.0	116	193	117	102
Jap.	145	30	M	N	74	M.K.	1.2	129	167	82	100
Port.	125	25	M	A	75	F.V.	1.2	102	121	94	85
Jap.	150	35	M	P	76	E.N.	1.2	110	135	110	115
Cauc.	127	55	F	A	77	B.S.	1.2	108	158	85	92
Cauc.	123	31	F	N	78	E.M.	1.2	107	133	83	72
Cauc.	104	54	F	A	79	C.Y.	1.2	100	125	97	94
Cauc.	125	54	F	A	80	A.L.	5.6	88	119	93	93
Kor.	105	23	F	A	81	D.V.	1.2	100	176	155	87
Cauc.	112	58	F	A	82	A.N.	1.2	107	188	175	165
B. *Five cases with hypoglycemia*											
Jap.	110	24	F	A	83	M.S.	1.2	76	115	100	*70*
Cauc.	152	45	F	N	84	M.H.	1.2	96	122	*66*	97
Jap.	118	23	F	A	85	B.H.	1.2	97	137	78	*67*
Chin.	134	33	F	P	86	E.L.	1.2	92	136	*48*	*64*
Jap.	94	25	F	A	87	M.H.	1.2	108	115	*62*	77

* A. Asthenic = 22 cases = 55%.
N. Normal = 14 cases = 35%.
P. Pyknic = 4 cases = 10%.

** Fasting achlorhydria prior to histamine stimulation.

TABLE 3. *Nine cases of non-duodenal ulcer with achlorhydria*

Nat.	Wt. (lbs.)	Age (yrs.)	Sex	Habitus*	Series No.	Initials	pH (chem.) gastric contents**	Glucose tolerance test (blood sugar, mg./100 cc.)			
								Fasting	½ hr.	2 hrs.	4 hrs.
Jap.	104	72	F	A	88	J.M.	8.8	97	162	94	100
Jap.	115	80	F	A	89	K.H.	7.2	102	122	93	95
Jap.	130	39	M	N	90	I.A.	8.8	95	176	78	95
Cauc.	112	40	F	A	91	H.T.	8.8	100	148	97	84
Jap.	125	19	M	N	92	R.M.	7.2	100	139	98	87
Cauc.	134	52	F	P	93	E.L.	7.0	109	138	87	103
Port.	142	47	F	P	94	A.V.	8.4	100	127	127	83
Cauc.	157	58	M	P	95	G.S.	7.4	115	205	150	168
Jap.	150	39	M	N	96	M.I.	8.2	100	173	109	88

* A. Asthenic = 3 cases = 33%
N. Normal = 3 cases = 33%
P. Pyknic = 3 cases = 33%

** Fasting achlorhydria with histamine stimulation.

phosphorus, 440 mg.; iron, 15 mg.; thiamine hydrochloride, 10 mg.; riboflavin, 10 mg ;pyridoxine hydrochloride, 1 mg.;calcium pantothenate, 5 mg.;niacinamide, 100 mg.; vitamin B_{12}, 5 mcg.; ascorbic acid, 100 mg.; vitamin A, 4,000 U.S.P. units; vitamin D, 400 U.S.P. units; and whole liver substance, 1 Gm.

2. A preparation containing in each 100 grams—protein, 70 Gm.; carbohydrate, 22 Gm.; yeast extract from 15 Gm. of yeast; liver concentrate, 2 Gm. This was supplemented to present approximately—thiamine hydrochloride, 5 mg.; riboflavin, 5 mg.; pyridoxine hydrochloride, 2 mg.; calcium pentothenate, 10 mg.; nicotinamide, 30 mg.; and folic acid, 2 mg.

From a practical standpoint, the average patient received about 30 grams of protein at each of the three main meals, and about 15 grams of protein as exemplified by 1 ounce or 0.5 ounce of a nutrient supplement taken one hour to one and one-half hours after each meal, just prior to the time at which the drop in the glucose tolerance curve to the sub-fasting level could be expected.

In one of the duodenal ulcer patients without hypoglycemia, there was an achlorhydria requiring histamine stimulation, which thereupon produced a gastric acidity of pH 1.2. In none of the hypoglycemic cases, either with or without duodenal ulcer, was there an initial achlorhydria encountered requiring histamine stimulation. However, in 2 of the hypoglycemic cases with duodenal ulcer, there were relatively high pH values, one of 5.6 and another of 4. These patients, nonetheless, were given histamine and a pH value of 1.2 obtained in each case.

CONCLUSIONS

Moderate hypoglycemia following a carbohydrate meal is one of the several factors responsible for increased gastric acidity.

A survey has been made of 96 cases of ulcer, with and without hyperacidity. Of these, 47 were proven duodenal ulcer with hyperacidity, 49 were non-ulcer cases with hyperacidity, and 9 were non-duodenal ulcer with achlorhydria.

Fifty-one per cent of the patients with proven duodenal ulcer were found to have hypoglycemia (70 mg. per 100 cc. or less), whereas 12.5 per cent of the patients with non-duodenal ulcer and free acid in the gastric contents were found to have hypoglycemia. There were no instances of hypoglycemia in the achlorhydric group of non-ulcer patients.

A diet with ample protein in each of the three main meals and supplementary amino acid feedings was used as an adjunct in the management of these duodenal ulcer patients.

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BODY MECHANICS IN GERIATRICS*

K. G. HANSSON, M.D.†

Cornell University Medical College; the Hospital for Special Surgery, and the New York Hospital, New York, N. Y.

Geriatrics is defined in our dictionaries as that branch of medical science which is concerned with old age and its diseases. In the same dictionary, Gerontology is defined as the scientific study of the phenomena of old age. These two terms are used alternately. However, Geriatrics is becoming more comprehensive and Gerontology tends to deal only with the biologic aspects of advancing age. We see already on the horizon a new specialist—the geriatrician, who will do for old age what the pediatrician does for early age.

Our medical literature during the last ten years has seen many articles concerning our increased life span. We learn with interest from fossil findings that in prehistoric times the average man lived about 18 years, his life often terminated by violent death. In ancient Rome the average age had reached 25 years and at the time of the American Revolution the average expectation of life at birth was 35½ years; by 1900 it has reached 50 years, and in 1950 it has risen to about 68 years. This rapid increase in life span, especially during the last fifty years is due to many factors. Great advances in medical science, the increase of medical services, progress in public health, and increased standard of living are probably all responsible for the control of disease and the lengthening of the average lifetime (1).

This increased life span has left us with over 13,000,000 people 65 years of age or more (2). It is the study of this group that we think of when we mention Geriatrics. The medical problem in this large group of aged patients may be divided into two chapters. One chapter deals with the aging of cells in all the tissues of the body. The other chapter deals with diseases of the aged.

AGING OF CELLS

This is a biologic process common to all living matter. We find that atrophy, dehydration, fibrosis, calcification and decalcification play a part in the various tissues of the body. We know that, with age, the skin becomes thin and loses its elasticity and tone (3). The muscle tissue loses strength, endurance and elasticity. Senile osteoporosis and demineralization are due to dissipation of the protein portion of the bone in which mineral salts are deposited. The respiratory tract loses its elasticity and becomes less resistant to infection. The gastro-intestinal tract loses its resistance to malignancy and the same may be said about the genito-urinary tract. The circulatory system suffers mainly from calcification, and the resiliency of mind and emotions becomes less and less.

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† Associate Professor, Cornell U. Med. Coll., and Director of Physical Medicine, Hospital for Special Surgery, and New York Hospital.

DISEASES OF THE AGED

The report of 1,250 autopsies from data collected in Boston in 1952 shows that the most prevalent cause of death in old age is cardiovascular disease, *i.e.*, coronary sclerosis, atherosclerosis and vascular nephritis. Among the non-cardiovascular diseases, the most common causes of death are bronchopneumonia and cancer. Other conditions, such as active tuberculosis, blood diseases, gallbladder disease and gastro-intestinal ulcers are relatively rare (4).

My personal experience with geriatrics has been mainly in connection with body mechanics. When mechanical analysis is made of older patients, it is found that symptoms due to senility or postural defects are usually manifested as follows:

I. One of the more common postural defects of old age is the dropping forward of the head due to the increased curvature in the cervical region of the spine. This area often becomes the seat of osteoarthritis, resulting in pain about the neck, shoulder, and upper extremity, undoubtedly due to irritation of the nerve roots distributed along the cervical segments. When the third cervical segment is involved, there will be pain in the occipital region. Involvement of the fourth segment causes pain posteriorly along the medial border of the scapula; involvement of the fifth and sixth segments, pain about the shoulder; involvement of the seventh segment, pain along the dorsal surface of the hand in the half next to the thumb; and involvement of the eighth segment, pain along the dorsal surface of the hand and along the lateral half and posterior surface of the forearm. Irritation of the first thoracic segment will cause pain over the medial surface of the forearm.

It is undoubtedly mechanical pressure at the root of the nerve that is responsible for this radiculitis. If this is kept in mind, the basis for therapy is clear. Traction applied to the cervical spine, preferably with counter-traction on the shoulders, maintained for short periods of time and repeated several times a day will relieve the pressure on the nerve. Exercises for postural correction of forward flexion of the head will overcome the cause of the radiculitis, correct the faulty posture, and prevent recurrences. In severe cases the Thomas collar is sometimes used (5).

II. The second point that concerns us in the postural analysis of advancing age is kyphosis, *i.e.*, increased thoracic curvature, stooping shoulders and a depressed thoracic cage. The thoracic spine, instead of the normal forward curve, shows the well known outward curve of the round back. Contributory to this round back deformity is the forward displacement of the scapulae, with or without symptoms of pain and stiffness. The kyphosis, which is often the seat of osteoarthritis, gives a rigidity to the upper back. The displacement and stiffness of the shoulders often interfere with abduction, and external and internal rotation of the shoulders. The depressed thoracic cage interferes with free expansion of the lungs and markedly decreases the vital capacity. One point that is often overlooked is the fact that the depressed thorax pushes the viscera downward and is often the cause of the protruding abdomen (6).

Simple postural correction and exercise may prevent the foregoing deformities and may also correct them, when carried out conscientiously. Hyperextension exercise of the spine in prone position over a bed will prevent or correct the kyphosis. Codman's exercise will prevent or relieve stiffness in the shoulders. Weight lifting, using small weights of from five to ten pounds and raising them ten times, will restore the muscles of the shoulder girdle. Breathing exercises, extending the chest and widening the costal angle, will restore the contour of the thoracic cage and improve the vital capacity.

III. One of the more common complaints in old age is backache. We recognize many different types of backache, but one of the more common ones is the lumbosacral pain brought on by lifting or bending; this causes spasm of the erector spinae muscles. X-ray films may show nothing abnormal, or they may show an increased lumbosacral angle. We usually refer to this kind of backache as being postural or mechanical, due to an unstable fifth lumbar vertebra. Sudden stress or continued strain on a structurally weak skeleton that is intended for quadruped locomotion will bring on the symptoms. This weak skeletal construction is finely balanced by opposing muscular pull, a mechanism which controls the position of the pelvis using the hip joint as a fulcrum.

Thus the abdominal muscles oppose the downward pull of the rectus femoris in front; and posteriorly the erector muscles pull the pelvis up and are opposed by the downward pull of the hamstrings. To complicate the picture, there are the hiking muscles tilting the pelvis laterally and opposed by gravity, and also the muscles responsible for the twisting of the trunk on the pelvis. Any interference with this delicate balance of muscles may produce pain in the lumbosacral region.

If the mechanical basis for these backaches is kept in mind, the treatment becomes obvious. The muscles that maintain the proper relation between pelvis and spine must be reinforced by prescribing exercises for abdominal muscles in front, gluteal muscles posteriorly, and for the muscles involved in the pelvic tilt. In addition, the patients should be instructed in general correct body mechanics, the use of a hard bed to sleep on, and a support when indicated. Such treatment is not only curative but preventive.

IV. The fourth point concerns shortening of the hamstrings. It is rational to assume that with advancing age we become less active, and spend less time on our feet, *i.e.*, we sit or lie down more than we stand or walk. In the absence of sickness, we sit during most of our time out of bed.

When we analyze the sitting posture we find its mechanisms very much the same as those of the standing posture, except for the fact that the thighs are horizontal and there is more or less 90-degree flexion in the hip and knee joints. The effect of this position on the muscles is shortening of the hip flexors and hamstrings and stretching of the quadriceps. If this is not corrected, it will result in a standing posture with slight flexion in the hips and knees. Tight hamstrings will prevent locking of the knee in complete extension and this condition is responsible for the senile gait with flexed knees and a shortened step.

A shortening of the hamstrings occurs with respect to both origin and insertion. This tends to flex the knee and rotate the pelvis posteriorly. Such a rotation of the pelvis tends to decrease the lumbosacral angle and flatten out the lower back. This condition is sometimes found in cases of lumbosacral pain, although not as frequently as the lordosis deformity.

The gait of a patient of advanced age, recognized by short steps and slightly flexed knees and hips, can be explained by shortened hamstrings due to excessive sitting. The treatment, if any, consists of heat and gentle massage to the hamstrings for the purpose of relaxation, and exercises for the quadriceps.

V. Then there is the elderly patient who comes for consultation because of severe cramps in the feet and legs when walking, but relieved during rest. The history is one of gradual onset over a considerable period of time. The patient has usually tried out various kind of shoes and supports without benefit. Examination shows pallor of the skin on elevation of the leg, and rubor when the part is dependent. The dorsalis pedis artery and the posterior tibial artery are either difficult to palpate or nonpalpable. Arteriosclerosis is evident in other parts of the body (7). Just as angina results from arteriosclerosis of the coronary arteries, cramps result from similar changes in the arteries of the legs. The early symptoms of arterial disease in the leg are often called intermittent claudication; this condition may be unilateral at first, or may be more pronounced in one leg than the other.

The reason I mention intermittent claudication is that I see so much of it and patients have spent so much time and money on shoes and physical therapy treatments in useless efforts to relieve their symptoms. What do we have to offer such patients? First, we can reassure them to the effect that their symptoms are early, and that these early symptoms should serve as a warning about the amount of activity they should undertake. Secondly, there is a set of exercises which has proved very useful. These vasomotor exercises (Buerger) are as follows: the patient lies on his back with the legs elevated at 45 degrees for two minutes; then he lowers the legs over the edge of the bed for three minutes, during which time all motions of ankles and toes are performed; finally the legs are rested horizontally for five minutes. This procedure is repeated three to six times, morning and evening.

DISCUSSION

These five clinical groups have made a definite impression on me for many years. Although irreversible conditions are common among older patients, it is encouraging to report that in the foregoing five clinical groups patients can be markedly relieved and many times completely cured. In order to produce any lasting improvement, repeated treatments are necessary, but these may be carried out without producing any serious addiction. I, therefore, strongly recommend physical means in the treatment of chronic ailments in the aged patient, instead of having him rely on certain drugs for sedation which may seriously imperil his general health.

CONCLUSION

With the ever increasing span of life we come more and more in contact with elderly patients. In dealing with their body mechanics it is found that a great many elderly patients have complaints that fall within the following categories:

1. Forward flexion of the head and neck with osteoarthritis of the cervical spine, causing radiculitis in the upper extremities.
2. The round-back deformity, with round shoulders, depressed thorax, pain in the shoulders and decreased vital capacity.
3. Low back pain, mechanical or postural in origin, resulting from an unstable fifth lumbar vertebra.
4. Short hamstring muscles which tilt the pelvis backward and flex the knees, producing a shuffling gait with short steps.
5. Painful cramps in the calves of the legs when walking, but relieved during rest. This condition is often called intermittent claudication and has its origin in arteriosclerosis of the peripheral arteries.

These symptoms respond readily to the proper kind of physical procedures, mainly those of therapeutic exercises.

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GYNECOLOGIC PROBLEMS IN OLDER WOMEN

J. H. RANDALL, M.D.

The Department of Obstetrics and Gynecology, State University of Iowa, Iowa City, Iowa

The phenomenal progress of medicine during the past twenty-five years has greatly lengthened the average span of human life. More women are living to an older age than formerly. This trend has increased the incidence of certain gynecologic disorders peculiar to this period of life. In the future, geriatric gynecology must be emphasized, for the longevity of women will continue to increase as medical progress is made.

Although female patients live longer than formerly, the average age at the menopause has not significantly changed. Most women, as in the past, will stop menstruating between the ages of 40 and 50. Ovaries do not cease functioning at the menopause; they continue to produce estrogens for many years at a level insufficient to provoke endometrial bleeding but in amounts adequate to prevent atrophy of the genital tract. It is not uncommon to see women in the sixties or seventies who show well cornified cells in the vaginal smear, indicating an estrogen effect. Some physicians feel that there are extra-ovarian sources of estrogens, such as the adrenal glands. However, if ovaries are completely removed by surgery, vaginal smears uniformly show atrophic epithelium within four to six weeks. In all probability much of the estrogen which occurs in women beyond the menopause is ovarian in origin. This is one good reason for not being too radical in removing normal ovaries in women who are being operated upon for benign disease.

ATROPHIC VAGINITIS

Since more women are living to an older age, the incidence of atrophic vaginitis is increasing. This condition is a combination of atrophy associated with low estrogen, and of a nonspecific infection. The thinning of the vaginal epithelial covering and the decrease of vaginal acidity permit organisms to infect the vagina. The most common symptom is a vaginal discharge which at times is blood stained. These patients should be carefully examined to rule out cervical carcinoma. If they have bleeding, and if no malignancy is encountered in the lower genital tract, a curettage should be performed. The treatment of atrophic vaginitis is the restoration of a normal vaginal mucosa by means of acid douches and the administration of estrogens. According to Brown and Bradbury 1 milligram of diethylstilbestrol taken orally produces a good cornification within ten days (1). A douche, using one teaspoonful of lactic acid or two tablespoonfuls of vinegar to a quart of water, will help to eradicate infection and will stimulate a natural vaginal flora. A good method of administering estrogens is to give 1 milligram of stilbestrol daily for three weeks and then omit it for an equal period of time. Sometimes the insertion of a tablet of stilbestrol (1 mg.) or a vaginal suppository of some natural estrogen high into the vagina gives a better psychic effect than when other routes of administration are used. When estrogens are

discontinued the vagina becomes atrophic within six to eight weeks, but most patients will remain symptomless because infection does not recur. If bleeding is induced, estrogenic therapy should be discontinued.

LEUKOPLAKIA

Another disease seen most commonly in postmenopausal patients is leukoplakia of the vulva. It is characterized microscopically by a thickening of the cornified, the prickle-cell, and the basal layers of the epidermis, with mild inflammatory infiltration of the subepithelial connective tissues. Whitish plaques commonly occur on the inner surfaces of the large labia, on the clitoris and in the region of the posterior commissure. Itching is the chief symptom and most often brings the patient to the doctor. Most authorities consider leukoplakia of the vulva to be a precancerous lesion and for this reason advocate that it be treated by simple vulvectomy. However, because of a tendency to recurrences and of residual and mutilating scarring, there is much to be desired from this type of therapy. Vitamin A, hormones, dilute hydrochloric acid and other conservative measures are usually ineffective and often fail to prevent the progression of the disease into carcinoma.

LICHEN SCLEROSUS ET ATROPHICUS

A disease of the vulva which is often confused with leukoplakia is lichen sclerosus et atrophicus, which few physicians understand and, except for a limited group of dermatologists, fail to diagnose. Those who have written much concerning leukoplakia fail to mention lichen sclerosus et atrophicus as a complicating diagnostic problem, and one wonders if they realize that this disease is a distinct entity from leukoplakia. It, too, is characterized by the presence of whitish patches, slightly elevated, involving the skin of the outer surface of the labia majora, the perineum, and the perianal region. Sections of the involved skin show a slight increase of the cornified layer but a marked decrease of the prickle-cell and basal layers of the epidermis. The so-called rete pegs or downgrowths of the basal layer are much decreased in size and number. The subepithelial connective tissue is replaced by a large band of homogenization with some inflammatory cells in the deeper zone. This lesion is sometimes associated with itching and, according to Wallace and Nomland (2), has no tendency to develop into carcinoma. The fact that in this disease extragenital whitish areas appear in the skin underneath the breasts, over the clavicles, shoulders, back and arms, makes it readily distinguishable from leukoplakia. The lesion is one of chronic atrophy and responds poorly to all forms of medicinal therapy. The application of bland ointments, such as cold cream with 0.5 per cent phenol, the elimination of soap and water from contact with the vulva, and the use of small doses of estrogens permit patients to tolerate and live with the disease. Certainly very few or any of these patients should be subjected to the mutilating operation of vulvectomy. The operation cannot be justified on the basis that carcinoma of the vulva might develop, for this lesion does not tend to progress into cancer.

KRAUROSIS

Women beyond their natural menopause, and even younger individuals who have been castrated by surgery or sterilized with irradiation often show a marked shrinking of the tissues around the introitus of the vagina. The term kraurosis should be used only to designate the condition of shrinking and should not be used to include leukoplakia or lichen sclerosus et atrophicus, with which it is often associated. Because of the marked contraction of the introitus, dyspareunia is a prominent symptom. The use of lubricants during intercourse is usually more satisfactory than operations which have been devised to enlarge the vaginal outlet. More trauma can be tolerated by the patient when the epithelial covering of the vagina has been thickened by the administration of estrogens.

PROLAPSE

Atrophy, which is a natural accompaniment of the aging process, is one of the principal etiologic factors in the development of prolapse of the uterus and vagina. Women who live long enough cannot escape the weakening of the pelvic supporting tissues from atrophy, and often a prolapse will develop or a preexisting one will become more severe in the postmenopausal years. It is not uncommon to see in older women severe degrees of prolapse, with marked ulceration around the cervix. The fact that patients have slight vaginal bleeding encourages them to seek medical advice. A marked degree of prolapse causes difficulty in urination but seldom gives any trouble with defecation.

Prolapse of the uterus is best treated surgically, although there is a limited use for pessaries. Those who have some contraindication to surgery or who may be radically opposed to operation should be treated with a pessary. In order to wear a pessary the levator sling should be adequate, otherwise the patient often loses the pessary in a toilet or in some other inconvenient place. A pessary for the correction of prolapse should be one which stretches the vagina in its transverse axis. It should be emphasized that it doesn't cure the prolapse but does prevent the natural tendency for the condition to progress. Usually hard-rubber or plastic pessaries are best tolerated. A patient who is wearing a pessary should take a daily cleansing douche and should report periodically to the doctor for examination. Careful observation of these patients by the physician will prevent severe ulcerations of the vagina and incarceration of the pessary.

Most older patients, even those with severe degrees of prolapse, can usually tolerate operative procedures which for the most part give more satisfactory results than pessaries. Patients should be prepared for operation by an adequate period of bed rest with the prolapse reduced, by daily douches for cleanliness, and by estrogens for stimulation of epithelialization. This preparatory treatment reduces the edema, shrinks the tissues and should eliminate any infected ulcerating areas. Ulcerations seen in prolapse are usually not malignant, but if they do not readily regress during a regimen of bed rest and douches, a biopsy specimen should be taken to exclude cancer.

The operations most satisfactory for the correction of prolapse are vaginal hysterectomy with a good fascial repair of the vaginal walls, cervical amputation

combined with repair of the vaginal walls (Fothergill) and the obliteration of the vagina (Le Fort). Abdominal operations for prolapse are usually less satisfactory and involve a greater risk. Although Mengert (3) demonstrated on the cadaver the fallacy of using the round ligaments for support, some physicians continue to use abdominal suspension for the treatment of prolapse. In many instances the patient begins to experience a recurrence soon after she leaves the hospital. The fixation of the fundus or the cervix of the uterus to the rectus fascia of the abdominal wound gives some support to the vaginal apex. If this operation is performed, it should be preceded by a plastic operation on each vaginal wall; otherwise the patient continues to have relaxation in the form of cystocele or rectocele.

The obliteration of the vagina or the LeFort operation is ideal for the elderly patient who has a considerable degree of prolapse and is willing to forego sexual intercourse. The operation is simple, consisting of a denudation of a rectangular area of mucosa on each vaginal wall, and suturing corresponding points together starting near the cervix or vaginal apex. It can be carried out under local anesthesia, permits early ambulation, gives the greatest assurance against recurrence and involves the least risk of all surgical procedures for the correction of prolapse.

CARCINOMA OF THE CERVIX

Although the longevity of women has been increased, most carcinomas of the cervix occur between the ages of 40 and 50, and of the endometrium between 50 and 60. However, more malignancies of the female genital tract are being seen in women between the ages of 60 and 70, than formerly. They offer the same problems of diagnosis and treatment as those occurring in younger people. A woman, regardless of her age, who has unusual bleeding or leucorrhea should have a thorough investigation of the genital tract. At least 2 out of 3 women, in whom vaginal bleeding occurs beyond the menopause, have a malignant lesion and all have some type of pathologic condition to explain the bleeding. A common mistake made in treating elderly patients is to regard slight bleeding as due to a mucous polyp of the cervix, and to perform only a polypectomy. Some of these patients have endometrial cancer and should have had a diagnostic curettage as well as removal of the polyp.

Patients who have cervical cancer should be treated largely with irradiation therapy. Radium is usually used to treat the local lesion, and deep x-ray therapy is employed to combat spread into regional lymphatics and into the parametrial tissues. Older patients often do not tolerate as much deep x-ray therapy as younger women; moreover a contracted vagina frequently makes application of radium difficult. Those who have endometrial cancer are best treated with multiple foci of intrauterine radium, followed in four to six weeks by complete hysterectomy. Patients who are inoperable because of their general condition or because of the extent of the cancer should be treated only with irradiation. At least 90 per cent of women who have endometrial cancer can tolerate well the combination of intrauterine radium therapy and hysterectomy.

OVARIAN CARCINOMA

Ovarian carcinomas are often seen in women beyond the menopause. Any lower abdominal or pelvic mass appearing in older women is likely to be an ovarian tumor and often malignant. The presence of ascites, small masses in the omentum or cul-de-sac, and bilateral tumors, are all suggestive of ovarian malignancy. All ovarian tumors which are 2 or more inches in diameter should be removed, even if they are not causing symptoms. If an ovarian tumor is malignant, both the adnexa and the entire uterus should be removed. Surgery should be followed with intraperitoneal radioactive gold therapy if there is no spread, and both gold and deep x-ray therapy if there are implants or invasion of surrounding structures.

INFECTIONS

Specific infections of the lower genital tract are occasionally seen in older women. Those who are diabetic have a predisposition to monilia vulvovaginitis because of the large amounts of sugar secreted in the urine. The vulva presents a purplish red color covered with a thin whitish frosting on the surface. The discharge produces severe itching and is often not typically cheesy but purulent, because of infection with other organisms. A definite diagnosis can be made by culturing the discharge on special acid media or by finding branching filaments (mycelia) and oval forms (conidia) in stained smears. Treatment consists of the application of 2 per cent gentian violet or the vaginal instillation of propionic jel. There is a tendency to recurrence unless the diabetes is rigidly controlled.

Trichomonas vaginalis vaginitis is not uncommon and causes considerable irritation and itching around the introitus of the vagina. The diagnosis is best made by finding flagellated and motile organisms in a saline suspension of the discharge. The most convenient treatment is the vaginal insertion of tablets (such as Vioform, Devegan, Floraquin, or Vagisol) three times a day, along with daily acid douches.

There are many cases of simple pruritus in older patients which are not gynecologic in origin; for instance, itching which occurs around the anal region is never due to a vaginal infection. When itching occurs in association with vaginitis, the history is of short duration and it is easy to isolate the organisms from the discharge.

Purulent endometritis occurs commonly after the menopause. Secretions, which accumulate in the uterine cavity as the result of cervical stenosis, become infected and form a pyometra. These patients often complain of a purulent discharge, which at times is slightly bloody. The condition is often associated with uterine carcinoma, especially cancer of the cervix. Adequate drainage should be instituted by thorough dilatation of the cervical canal. Subsequently, the cervical canal and uterine cavity should be curetted in order to eliminate carcinoma as a cause of the stenosis.

Upper-tract pelvic infections are seldom seen after the cessation of menstruation. All cases of salpingitis, with the exception of those due to tuberculosis, are ascending infections which take place only during a menstrual period. Some

pelvic infections which are not tubal are the result of a diverticulitis of the sigmoid colon, or of a ruptured appendix.

CONCLUSIONS

Gynecologic diseases are by no means limited to patients in the menstruating and childbearing years. Those conditions which are related to atrophic disturbances are especially encountered beyond the menopause. In order to make the geriatric patient a happier, healthier, and more useful person, physicians must understand the gynecologic problems of this period of life and know how to treat them intelligently.

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PROBLEMS IN PULMONARY RESECTION FOR PRIMARY LUNG TUMOR IN THE AGED

WILLIAM E. ADAMS, M.D.

The Department of Surgery of the University of Chicago, Chicago, Illinois

It has been the impression of most surgeons that major operations are less well tolerated by older people than by individuals in the younger age group. However, it probably has not been fully appreciated that if complications due to concurrent and associated disorders are obviated, operations may be as well tolerated by the aged as by younger people. This is substantiated by the fact that hazards in the older age group are much greater when the operation is of an emergent nature rather than one of election. Although it is difficult to find uniformity in studies reported in the literature, Cole (1) in a review of 3,656 major operations of all types performed at the Illinois Research and Education Hospital from 1948 to 1952 found the foregoing conclusions to be justified from an analysis of their statistics.

In the case of pulmonary resection for primary tumors of the lung, additional factors come into play in evaluating the risk of operative therapy. Although there are many reports regarding various aspects of pulmonary resection for diseases of the lung, little consideration has been given to a comparison of the risk of operation in the younger and the older age groups. The importance of an investigation of this problem is emphasized by the following facts. Life expectancy has increased from 48 years in 1900 to 68.27 years in 1950. Thus, the number of elderly people who present themselves for pulmonary surgery has been markedly increased. Groom (2) stated that whereas the increase of population in the United States between 1930 and 1940 was only 7 per cent, the increase of individuals between 65 and 74 years of age was 35 per cent, and the number of people living past 75 years of age had increased 38 per cent. Primary tumor of the lung, which is one of the principal indications for pulmonary resection in the older age group, has increased markedly in frequency during the past two decades. A review of statistics reveals that the death rate in the United States from bronchogenic carcinoma increased 144 per cent between 1938 and 1948 (3).

PHYSIOLOGIC CHANGES OCCURRING WITH ADVANCING YEARS WHICH ALTER THE FUNCTION OF ORGANS AND TISSUES

Although a number of alterations or deficiencies may occur in organs and tissues of the body with advancing years, several of these gravely influence the patient's course following pulmonary surgery (Tables 1 and 2). Probably the most important alteration is reduced pulmonary reserve. Although this is not necessarily determined by the chronologic age of the patient, it is generally accepted that reduction in pulmonary reserve of a significant degree is more often found in the aged. In addition to the pathologic lesion for which the patient seeks medical or surgical attention, frequently a previous reduction in pulmonary

TABLE 1. *Etiologic Factors Causing Alteration of Normal Physiology in Advancing Years*

1. Reduced pulmonary reserve
2. Cardiac disease
3. Vacular disease
4. Alteration of nutritional status
   (a) Malnutrition
   (b) Obesity

TABLE 2. *Preoperative status of 31 patients who died following surgery*

System	Patients aged 60 years and above			Patients aged 59 years and below		
	Good	Fair	Poor	Good	Fair	Poor
Pulmonary	2—12%	8—50%	6—38%	2—13%	4—27%	9—60%
Cardiac	2—12%	10—63%	4—25%	5—33%	4—27%	6—40%
Vascular	1— 6%	10—63%	5—31%	6—40%	3—20%	6—40%

reserve due to an inflammatory or degenerative disease has occurred. Under such circumstances the hazards attending pulmonary resection are much greater than those accompanying extrathoracic procedures, since pulmonary reserve is still further reduced by the ablation of lung tissue and by interference with respiratory activity. Furthermore, the increased strain on cardiac activity due to reduction of the vascular bed of the lesser circulation with resultant pulmonary hypertension is an additional factor which may be of considerable importance in the postoperative course of the patient following pulmonary resection.

Pathologic changes in the heart, such as healed myocardial infarcts and other alterations occurring as the result of longstanding pulmonary involvement, may at times interfere with cardiac function following pulmonary resection. Consideration has been given this problem by several investigators, in an attempt to find a means of supporting cardiac activity prior to surgery in order to avoid deleterious postoperative effects. To date there seems to be no universal agreement as to the value of drugs for this purpose when no evidence of cardiac decompensation is present.

Degenerative changes in the vascular system, including coronary and cerebral arteries, occur with increasing frequency in the elderly. The age at which these changes begin is variable, and the degree of change cannot be accurately determined by the chronologic age of the patient. With decreased elasticity of the vessels due to arteriosclerosis, complications such as cardiac ischemia, hypoxia, cerebral hemorrhage, and hemorrhages from other sources such as gastroduodenal ulcers, frequently occur. Furthermore, the dangers from hemorrhages, renal dysfunction and hypoxia are apt to be considerably greater than when these complications occur in the younger age group. For these reasons the role of anesthesia assumes a much greater degree of importance in patients showing evidence of advanced vascular changes (4).

The nutritional status of the patient may play an important part in the outcome following pulmonary resection. This is true whether the patient is either

markedly undernourished or is overweight. It is well appreciated that correction of malnutrition and restoration of normal body fluid and electrolytes are more apt to be required in the older age group than in younger individuals. Obesity places an excessive strain on cardiopulmonary function. These factors must be taken into consideration in evaluating the risk of operation, and all available means should be employed before surgery for conversion of the patient to a status as nearly normal as possible.

COMPLICATIONS OF A SERIOUS NATURE FOLLOWING PULMONARY RESECTION

In a study comparing the risk of operation in patients of an elderly versus a younger age group, it is difficult to establish a dividing line between these two categories. Previous authors have based their investigations on age groups varying from 40 to 70 years. In Cole's analysis of available statistics on operations in general, the age of 60 was set as the dividing line between young people and those of advanced years. The present study was based on a series of 202 operations for primary tumor of the lung, including 141 pulmonary resections. The patients were divided into three groups. Those of 60 years of age and above were classified as the older age group and included 69 individuals. For comparison, 81 patients between the ages of 50 and 59, as well as 52 patients under 50 years of age were studied (Table 3). Although this series is too small to provide conclusive statistical information, nevertheless much can be learned regarding the factors contributing to the hazard of operation.

Cardiorespiratory failure

One of the most common serious complications and, as seen in Table 4, one which most frequently causes death (38.7 per cent in this series of resections) is postoperative cardiorespiratory failure. This category includes patients who have difficulty in eliminating tracheo-bronchial secretions which frequently

TABLE 3. *Mortality rates for 202 operations on patients with primary tumors of the lung*

Comparison of risk in patients of various age groups

Total resections 142

Total deaths 26—18.4%

Age (yrs.)	Exploration		Pneumonectomy		Lobectomy		Grand total	
	No. of patients	Deaths No.—%	No. of patients	Deaths No.—%	No. of patients	Deaths No.—%	No. of patients	Deaths No.—%
60 and above	19	2—10.5	35	12—34.2	15	2—13.3	69	16—23
50–59	30	2— 6.6	39	9—23.0	12	2—16.6	81	13—16
49 and below	11	1— 9.0	25	0— 0.0	16	1— 6.2	52	2— 3.8
Totals								
59 and below	*41*	*3— 7.3*	*64*	*9—14.2*	*28*	*3—10.7*		
All ages	*60*	*5— 8.3*	*99*	*21—21.2*	*43*	*5—11.6*		

TABLE 4. *Cause of death in 202 operations for primary tumor of the lung*
Two age groups compared

Diagnosis	69 Patients aged 60 years and above			133 Patients aged 59 years and below			Total deaths	
	Pneumonectomy	Lobectomy	Exploration	Pneumonectomy	Lobectomy	Exploration	Number	Per cent
Cardio-respiratory failure	5	1	1	3	2	—	12	38.7
Cardiac failure	2	1	—	2	—	1	6	19.4
Vascular factors	2*			1**				
	1†	—	—	1*	—	1‡	6	19.4
Carcinomatosis	1	—	1	—	1	1	4	12.6
Bronchial fistula and technical factors	1	—		2§	—		3	9.6

Vascular:

* Pulmonary embolism (3 cases).

** Hemorrhage from gastric ulcer (1 case).

† Cerebral hemorrhage (1 case).

‡ Hemorrhage from duodenal ulcer (1 case).

§ Pulmonary hemorrhage (2 cases) (ligature cut through pulmonary artery following operation in 1).

tend to produce obstructive atelectasis and pneumonitis. It is probable that following pulmonary resection most patients have some degree of these complications even if only transitory in duration. This diagnosis also includes patients who have previously shown evidence of deterioration of the lung by emphysema and fibrosis. Further, because of the markedly decreased vascular bed in the lungs of these patients, pulmonary hypertension with increased strain on the heart may be produced, adding a cardiac element to the pulmonary element in the diagnosis of the condition. Cardiac strain may be a significant factor in the cause of death of some of these patients, even in the absence of bronchial occlusion by secretions. As noted in Table 4, death from this cause occurred almost three times as frequently in the older age group as in younger people (7 out of 69 patients or 10.14 per cent, compared to 5 out of 133 patients or 3.86 per cent). In experiments on dogs Carlson *et al.* (5) found that pulmonary hypertension increased in severity following the resection of more than 50 per cent of the pulmonary tissue. When the lung capacity was reduced to less than 20 per cent, few animals could tolerate the marked pulmonary hypertension which developed. In subsequent experiments on dogs (6), pulmonary artery pressure and arterial blood oxygen saturation were recorded continuously during the reduction of lung capacity to as little as 15 or 25 per cent. Although a considerable degree of pulmonary hypertension to as much as 100 per cent of normal developed, arterial blood oxygen saturation fell an average of only 5 to 7 per cent. This would appear to indicate that the lung has a larger reserve for maintaining a satisfactory level of arterial blood oxygen saturation, than a capacity for transporting blood from the right to the left heart without producing an intolerable pulmonary hypertension.

Cardiac failure

The second most common cause of fatal complications in this series of cases was cardiac failure. This was usually on the basis of a pre-existing lesion, such as a healed myocardial infarct or rheumatic heart disease. In general, patients with chronic cardiac damage tolerate operations better than was once thought to be the case. As has been repeatedly stated in the literature, this is perhaps because every effort is made in these individuals to avoid hypoxia and overstrain of the heart during and following surgery. In this study there were twice as many cardiac deaths in the older age group as compared to patients under 60 years of age (3 out of 69, compared to 3 out of 133).

Bronchopleural fistulae

In the earlier stages of development of pulmonary resection, bronchopleural fistulae with empyema were frequently responsible for fatal terminations following pulmonary surgery. Although this complication still prolongs the period of recovery, control of intrathoracic pressures by suction drainage, and of infection by chemotherapy, have reduced its risk to the patient. In the present series of 141 resections, a fatal termination from a bronchial fistula occurred in only 1 patient.

SURGICAL MANAGEMENT

In order to reduce the risk of pulmonary resection in older people to a minimum, four factors in surgical management should be emphasized: 1. Adequate *preoperative study* of the patient, including the determination of both physiologic and pathologic alterations. 2. *Preoperative preparation* of the patient for restoration of tissue fluids and electrolytes, and of blood volume; improvement of nutritional state; improvement of pulmonary status when possible; and support of cardiac activity (if necessary). 3. *Protection of the patient during surgery* (a) by careful choice of anesthetic agent and method of administration, and management of anesthesia by an experienced anesthesiologist, (b) replacement of blood loss, and (c) maintenance of adequate gas exchange and circulation. 4. *Safeguards following operation* to include (a) support of pulmonary function with adequate oxygen therapy, (b) prevention of shock, (c) maintenance of optimum circulation, and (d) control of infection.

Preoperative preparation

When pulmonary resection is being contemplated, in addition to the customary studies which are carried out prior to all operations, special determinations for evaluation of cardiopulmonary reserve should be made. Besides the appropriate roentgenologic films and fluoroscopic examination, there should be studies of pulmonary function. Although these tests will show a large pulmonary reserve in the majority of people under 50 years of age, the reserve diminishes considerably during the sixth and seventh decade of life in most individuals. These studies should include not only the ventilatory function of the lungs by means of such measurements as timed vital capacity, and maximum breathing capacity, but

also the ability of the lungs to transfer gases across the membrane between the air and blood spaces. For an evaluation of this latter function, a procedure devised by Perkins *et al.* (7), which plots alveolar oxygen partial pressures against arterial blood oxygen saturation shows considerable promise.

In the preparation of these patients for operation considerably more than the usual attention should be given to restoration of the blood to as nearly a normal status as possible. Likewise, since pulmonary reserve is considerably reduced following surgery, the reserve should be improved by control of infection.

Anesthesia

It is generally agreed that some degree of hypoxia accompanies all operations, particularly when a general anesthetic is employed. In view of this, it is of paramount importance that anesthetic materials and methods should be selected for maintaining optimum oxygenation and circulation of blood to the tissues at all times during the surgical procedure (8). Because of the increased incidence of pre-existing vascular changes in organs such as the brain, heart and kidneys of elderly individuals, the hazards of even mild degrees of hypoxia are increased. By the use of the recording oximeter developed in these laboratories by Perkins *et al.* (9), much has been learned regarding factors which favor the development of hypoxia during surgery (10). Since pulmonary hypertension of a significant degree may develop following the resection of one lung, measurement of pulmonary tension during operation, before and following occlusion of the pulmonary artery, may be of value in deciding upon the extent of surgery, as well as indicating the scope of postoperative management. In addition, interpretation of untoward reactions following surgery may be made more rational, and more effective treatment be provided.

Postoperative care

The period of greatest risk to patients having pulmonary resection falls within the first two postoperative weeks, rather than on the day of operation. Due to the constant attention of an alert and intelligent anesthesiologist as well as the experienced surgeon during the operative procedure, patients seldom expire during surgery. This is true in spite of the fact that resection not infrequently includes a part of the adjacent structures or organs such as the chest wall, diaphragm or heart wall. These extensive resections add materially to the overall mortality from the surgical procedure, but are justified in an otherwise hopeless case. The most important hazard in the period immediately following surgery is reduced pulmonary reserve. All attempts should be made to maintain the function of the remaining lung at its optimum level. Continuous efforts at maintaining a clear bronchial tree by encouraging deep breathing and expectoration, along with prevention of overdistention as well as collapse of the lung, will accomplish much in reaching this goal. Repeated aspiration of bronchial secretions by catheter is frequently a life-saving measure. Bronchoscopic aspiration and tracheotomy should be employed more often when other methods fail to maintain a clear lung.

TABLE 5. *Mortality rate in operations for primary lung tumor in patients below 50 years of age*

Operation	Number	Deaths	Per cent
Pneumonectomy	25	0	0
Lobectomy	16	1*	6.2
Exploration	11	1*	9.0
Total	*52*	*2*	*4.0*

* Carcinomatosis (palliative operation).

TABLE 6. *Mortality rate in operations for primary lung tumor in patients of all ages*

Operation	Number	Deaths	Per cent
Pneumonectomy	99	21	21.2
Lobectomy	43	5	11.6
Exploration	60	5	8.3
Total	*202*	*31*	*15.3*

Changing the position of the bed patient, along with early ambulation, are important in proper postoperative management. Since preoperative vascular changes are frequently present, every means should be used to prevent stagnation of the blood and venous thrombosis.

Mortality

The causes of death in this series of 202 operations are shown in Table 4. It will be seen that the operative hazards were similar in both age groups of patients. The most common cause of death was cardiorespiratory failure, accounting for 38.7 per cent of the total deaths in this series. This cause of death would be expected more often following pulmonary resection than following general surgery. Cole's study showed an incidence of only 16 per cent in their series following all types of surgery. Cardiac failure was the next most single common cause and accounted for approximately 20 per cent; however it occurred twice as frequently in the older age group.

Tables 5 and 6 show a marked contrast in mortality rate in patients below 50 years of age, compared to that in patients 60 years of age and over. The preoperative status of the pulmonary, cardiac and vascular systems, probably more than anything else, played a significant role in the lowered mortality in patients below the age of 50 years.

In considering the mortality from pulmonary resection in all ages, extent of tumor involvement was undoubtedly an important factor. Much of the risk at times was related to the technical difficulties of the operation. Interference with the function of adjacent organs or structures by the resection was at least a contributing factor. Ochsner (3, 11) and others have emphasized this repeatedly. Conversely, Overholt (12) in a study of primary lung carcinoma found on mass x-ray screening, has shown that not only is the resectability rate greater (almost

100 per cent) and the risk of operation less, but also a much higher five-year survival rate may be anticipated when the tumor is discovered at an early stage before symptoms are present.

The number of lobectomies in this series is out of all proportion to pneumonectomies for two reasons. In addition to the patients with bronchogenic carcinoma, 13 with bronchial adenoma and 4 with benign lung tumors have been included. Of these last 17 patients, 7 underwent pneumonectomy and 10, lobectomy. The age group for the latter patients was considerably lower than the general average in the series. In far advanced cases, a lobectomy sometimes was performed to alleviate symptoms and not for curative purposes. However, in this latter group, the risk of lobectomy was at times greater than that of pneumonectomy in good-risk patients.

The preoperative status of the pulmonary, cardiac and vascular systems in the 31 patients dying following operation is shown in Table 2. It will be noted that only 4 patients in the two age groups were considered to have satisfactory pulmonary function preceding the operation, whereas 15 patients or 50 per cent were considered to have poor pulmonary reserve.

An attempt was made to correlate the preoperative status of the patients and the time of death in the two age groups. Table 7 shows that almost half of the

TABLE 7. *Correlation of cause and time of death in 31 patients following surgery for primary tumor of the lung*

Cause of death	Operation	Time following operation					
		Day of surgery	1–3 days	4–7 days	8–12 days	13–20 days	20+ days
Cardio-respiratory failure	Pneumonectomy	1	1	3	2		1
	Lobectomy		1		1		1
	Exploration	1					
Cardiac failure	Pneumonectomy	1				2	
	Lobectomy		1		1		
	Exploration	1					
Vascular factors	Pneumonectomy		2 (Pulm. emb.)	1 (Pulm. emb.)	1 (Gast. ulcer.)		1 (Cereb. hem.)
	Lobectomy						
	Exploration						1 (Duod. ulcer)
Carcinomatosis*	Pneumonectomy	2**	1*				
Pulmonary hemorrhage**	Lobectomy	1*				1†	
Bronchial fistula†	Exploration		1*	1*			

* Carcinomatosis—4.

** Pulmonary hemorrhage—1.

† Bronchial fistula—1.

deaths occurred within three days following operation. The remainder were scattered over a period of approximately three and one-half weeks following surgery. It is interesting to note that 3 patients dying of cardiorespiratory failure lived for more than one week, and 2 others lived for approximately three weeks.

SUMMARY

In a review of 202 intrathoracic operations for primary tumor of the lung it was found that the problems confronting the surgeon are similar for all age groups past the fifth decade of life. However, the difficulty in successfully managing serious complications due to deficiencies in cardiorespiratory reserve were greater in patients over the age of 60. Thus, the mortality rate for pneumonectomy in 35 patients 60 years of age or older was 34.2 per cent, whereas the mortality rate for 39 patients 59 years of age or younger was 23 per cent. In a breakdown of the latter group the mortality rate for 25 patients aged 49 years and under was zero. Furthermore, cardiorespiratory insufficiency as a cause of death was seen almost three times as frequently following pulmonary resection in patients aged 60 and above, than in younger people.

Cardiac failure, which accounted for 20 per cent of the total deaths, occurred twice as often in persons over 60 years of age. Since many factors are involved in the management of patients requiring pulmonary resection, it is difficult to determine accurately the difference in risk between the older and younger age groups. There seems to be little doubt that when the reserves of the pulmonary, cardiac and vascular systems are relatively good, patients in the advanced age group may tolerate pulmonary resection as well as those of younger years and should not be denied surgery.

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MORBIDITY AND MORTALITY OF ABDOMINO-PERINEAL RESECTION FOR CARCINOMA IN THE ELDERLY

J. A. BUCKWALTER, M.D., B. A. JOINER, M.D. AND S. E. ZIFFREN, M.D.

The Department of Surgery, State University of Iowa College of Medicine, Iowa City, Iowa

The growing importance of geriatrics is well exemplified by the increasing number of operative procedures performed upon elderly patients at the State University of Iowa Hospitals. Figure 1 illustrates the number of aged patients admitted to the surgical services, the number of operative procedures performed on these patients and the operative mortality during the three years 1950 through 1952. During this period, 7,499 surgical procedures at which an anesthesiologist was in attendance were performed upon 5,588 patients 60 years of age or older, with 339 deaths (4.5 per cent mortality). A growing consciousness on the part of the hospital staff as to the feasibility and importance of performing indicated surgical procedures in older patients is suggested by these figures. It will be noted that the mortality rate during this three-year period has remained essentially stationary, although the surgical indications have been steadily extended to include more patients with advanced lesions requiring more formidable procedures.

The surgeon must frequently decide whether or not an operation of considerable magnitude should be undertaken on the elderly patient. This problem is not posed by the emergency which demands that the indicated surgical therapy be instituted if the patient is to be salvaged. The elderly patient with adenocarcinoma of the rectum poses the type of problem to which we have reference. Can abdomino-perineal resection be justified in the patient of advanced age, or should only palliative procedures be considered if complications intervene? The established position of abdomino-perineal resection as the treatment of choice for this lesion must be weighed against the possible prohibitive morbidities and mortalities associated with aging. This paper deals with the morbidities and mortalities which occurred in elderly patients (60 years of age and older) upon whom abdomino-perineal resections were performed.

PATIENTS AND PROCEDURES

The patients included in this study were operated upon during the years 1947 through 1951. In Figure 2 it will be noted that the patients have been divided into four age groups. The diagnosis in each instance was adenocarcinoma of the rectum or rectosigmoid. Lesions were arbitrarily placed within one of two groups. Those lesions included in the "without-extension" group were confined to the bowel macroscopically and microscopically; those in the "with-extension" group were shown to have spread to nodes, prostate or uterus, but were judged grossly resectable. The data suggest that there was no relationship between age and the extent of the lesion.

A Miles type of abdomino-perineal resection was performed. In some instances resection of the vagina, uterus or a portion of the prostate was necessary in order

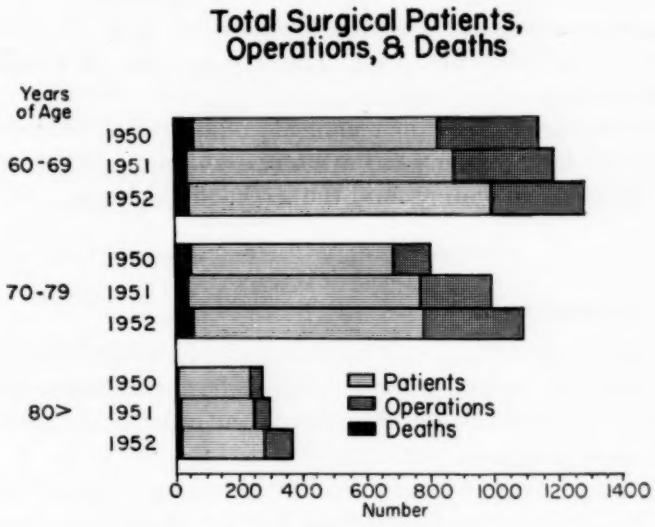

FIGURE 1

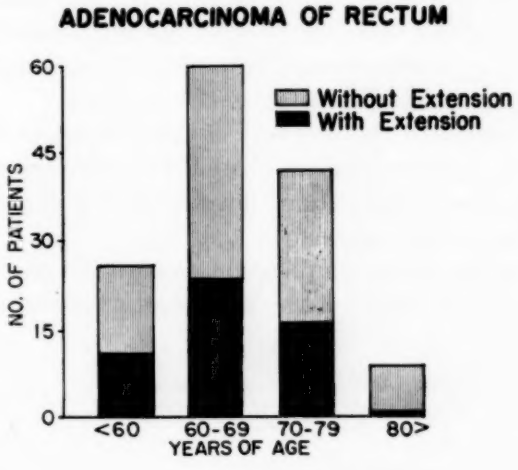

FIGURE 2

to encompass the lesion. More extensive procedures such as pelvic eviscerectomies were not included in this series. Age was not a factor in determining the extent of the resection, nor did it influence any other technical aspects of the operative procedure. Blood was administered during the operation as required, to replace that being lost and to maintain circulatory equilibrium. Inhalation anesthesia using cyclopropane or nitrous oxide as the primary agent was generally employed. The operations were performed by both residents and staff.

Naso-gastric tube suction was continued postoperatively until there was evidence of peristalsis. During this interval the patient's fluid balance was maintained by appropriate intravenously administered fluids. Penicillin and streptomycin were usually continued for a week to ten days, unless intervening postoperative complications dictated either prolonged or different antibiotic therapy. An indwelling Foley catheter was left in place for ten days in the average in-

stance. Ambulation was started within the first few days, depending upon the circumstances in the particular case. The average day of discharge was the twenty-second postoperative day.

It should be emphasized that the technical procedure was not influenced by the age of the patient. Each patient was evaluated and appropriate action taken as indicated by the physical findings and the status of the lesion.

POSTOPERATIVE RESULTS

Postoperative complications

Urological and non-urological complications are considered separately. In Table 1 are listed the complications observed during the postoperative course prior to discharge. Complications are listed in the order of the frequency of their occurrence in these groups of patients.

The most common urinary-tract complication was prolonged inability to void. The average day on which the indwelling Foley catheter was removed was the tenth postoperative day, the patient thereafter being continent. All patients who were not able to void satisfactorily on the twentieth postoperative day were included in the "prolonged inability to void" group. Transurethral resection or suprapubic cystostomy was necessary in 6 of these patients. Urethral perineal fistula and uremia occurred in 1 instance.

In Figure 3 are indicated the numbers of non-urological and urological complications occurring in these patients and the percentage of patients in each age group in whom these complications developed. It is apparent that individual patients had multiple complications.

The observed postoperative complications constitute one index of postoperative morbidity. However, many of the more subtle intangible features of post-

TABLE 1

Non-Urological Complications

Paralytic ileus
Abdominal wound infection
Perineal wound infection
Pulmonary—atelectasis, infarcts, pneumonia
Thrombophlebitis
Gastric dilatation
Cardio-vascular—coronary occlusion, congestive failure
Wound separation and evisceration
Colostomy—prolapse, stricture, and herniation
Mechanical intestinal obstruction
Peritonitis
Toxic psychosis
Vaginal perineal fistula

Urological Complications

Prolonged inability to void
Infection—pyelitis, and cystitis
Urethral perineal fistula
Uremia

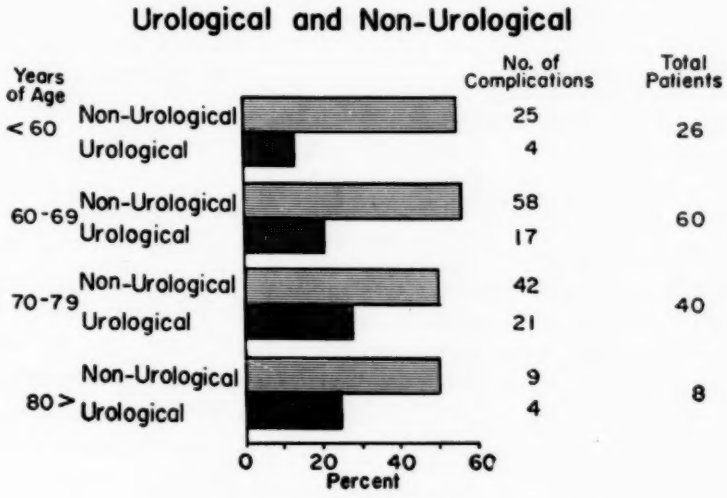

FIGURE 3

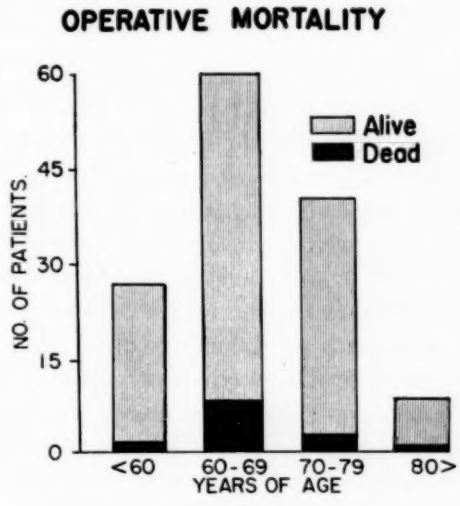

FIGURE 4

operative morbidity go unrecorded and would not be reflected in these figures. Such features might be reflected in the number of days of hospitalization prior to discharge. In the age group under 60 (26 patients) the average number of post-operative days was 18.5; in the group 60 to 70 years of age (60 patients) it was 21.7 days; in the 70 to 80-year-old group (40 patients) it was 23.2 days; in the group over 80 year of age (8 patients) it was 28.3 days. In the case of those patients transferred to the urology service for transurethral resection or supra-pubic cystostomy, the number of days prior to transfer was used.

Postoperative mortality

Figure 4 illustrates the mortalities in each age group of patients. An overall mortality rate of 11.2 per cent was observed in the 134 patients. In the 26 patients less than 60 years of age there were 2 deaths (7.7 per cent). In the 108 patients

TABLE 2

AGE (yrs.)	DEATH (days postop.)	CAUSE OF DEATH
60	6	Pulmonary embolus
66	12	Pulmonary embolus
69	10	Pulmonary embolus
72	15	Pulmonary embolus and pelvic floor hernia
81	5	Pulmonary embolus
65	20	Pulmonary embolus
59	17	Pulmonary embolus
79	8	Pulmonary embolus?*
78	15	Intestinal obstruction
55	7	Intestinal obstruction; massive atelectasis
69	18	Intestinal obstruction; uremia
69	7	Uremia
67	57	Rupture of aortic aneurysm
84	16	Peritonitis and cardiac failure
63	5	Myocardial infarction?*

* No postmortem examination.

over 60 years of age there were 13 deaths (12 per cent). These figures can be compared with a mortality rate of 10.2 per cent which resulted from 176 abdomino-perineal resections performed for benign as well as malignant lesions in patients of all age groups during this period at the University Hospitals (1). The age, day on which death occurred, and causes of death are given in Table 2. Postmortem examination was performed in all but 2 cases. Eight deaths occurred in men and 7 in women. The average age of the 15 patients who died was 69.0 years, compared with 65.8 years for the entire patient group. Death occurred, on the average, on the thirteenth postoperative day.

Pulmonary embolus was determined (by postmortem examination) to be the cause of death in 7 instances and also was probably the cause in another patient on whom no autopsy was performed. Death occurred between the sixth and twentieth postoperative days or, on the average, on the eleventh postoperative day. In no instance was antemortem phlebothrombosis or thrombophlebitis recognized. Gross examination of the venous channels at autopsy disclosed that the pelvic veins were probably the source of emboli in 2 cases and the femoral vessels in another. In 4 cases no source for the emboli was found. In 1 patient intestinal obstruction developed after operation, requiring re-operation on the twelfth postoperative day, with reduction of a loop of small bowel which had become herniated through a peritoneal floor defect. Death occurred three days later. At autopsy, massive occlusion of both pulmonary arteries by emboli was noted. Two of these 8 patients had wound infections.

Intestinal obstruction occurred secondary to herniation of a loop of bowel through a peritoneal pelvic floor defect. In one instance, resection of a gangrenous loop of small bowel was carried out, but the patient died three days later. In a

second case, a loop of small bowel became incarcerated around the colostomy in the left colic gutter and was a contributing cause of death. In a third instance, a loop of small bowel became strangulated in a defect in the peritoneum, with resulting gangrene and peritonitis.

DISCUSSION

The data presented disclose that with increasing age there is greater likelihood that patients will have urological complications following abdomino-perineal resection. Data obtained from a study of 176 patients in all age groups who had abdomino-perineal resection disclose that the longest periods of postoperative hospitalization were noted in those patients with urological complications (1). This increasing urological morbidity with aging would be anticipated, since it is well established that aging is related to increasing incidence of urological difficulties in the population as a whole.

An increasing incidence of non-urological complications has not been demonstrated with advancing age. Similar complications occurred in patients of all ages with essentially the same incidence. This suggests there is no intrinsic physiological change occurring with age which alters the patient as a candidate for surgery. The increasing urological morbidity would seem to be primarily on a mechanical basic, not significantly influencing operative risk if properly evaluated and managed.

The data suggest there is no significantly increased mortality rate with abdomino-perineal resection in older age groups. The 2 deaths which occurred among the 8 patients 80 years of age or older represent too small a number from which to draw any conclusions. The average age of the patients who died was 69.0 years, whereas that of the entire group was 65.8 years.

The cause of death was pulmonary embolus in more than half these cases. Antemortem phlebothrombosis or thrombophlebitis was not noted. It would appear that more thought and investigation must be directed toward the understanding and prevention of pulmonary embolism. The studies suggest that careful attention must also be given to adequate closure of the peritoneum, to peritoneal defects, and to the position of the colostomy if postoperative obstructions are to be decreased.

SUMMARY

1. The case histories of 134 patients with adenocarcinoma of the rectum or recto-sigmoid upon whom abdomino-perineal resection was performed during the years 1947 through 1951 form the basis of this study. The postoperative morbidity and mortality rates of these patients are reported.

2. Abdomino-perineal resection is a feasible operation when indicated, regardless of age, and can be performed with acceptable morbidity and mortality rates.

REFERENCE

1. Buckwalter, J. A.; Joiner, B. A., and Ziffren, S. E.: Unpublished data.

PSYCHOSURGERY IN OLDER PEOPLE

J. LAWRENCE POOL, M.D.*

College of Physicians and Surgeons, Columbia University, and The Neurological Institute, Presbyterian Hospital, New York, N. Y.

The fact that a person is older than he used to be is no reason for withholding help that is available to younger persons. Indeed, the criteria for performing elective surgical procedures on older people are the same as for younger ones, and hinge (a) on whether the contemplated procedure offers a good chance of relief with minimal risk of complications, and (b) on whether the particular individual is in sufficiently good physical condition to withstand the procedure. By proceeding on this basis the author has noticed little difference in the results of psychosurgery in older patients from those obtained in younger age groups, and this has been the experience of others such as Freeman (1), who has reported successful prefrontal and transorbital lobotomies in patients over 80 years of age. For purposes of this discussion let us consider patients between the ages of 60 and 75.

INDICATIONS FOR PSYCHOSURGERY

In this age group, the common conditions for which psychosurgery is indicated include the depressed suicidal states, such as involutional, agitated or reactive depressions. The latter are often secondary to a chronic crippling illness *e.g.*, advanced Parkinson's disease. Another category to be considered includes patients suffering from intractable pain and drug addiction due to cancer or other chronic disease processes. Chronic schizophrenia and manic-depressive psychoses in patients aged 60 or over can seldom be helped by psychosurgery (except from the point of view of better manageability), presumably because the process has become irreversible by the age of 60.

As a general principle, one must not only weigh the condition for which psychosurgery is being contemplated, but also the most advantageous type of surgery for each individual case. Before considering psychosurgery, moreover, one must first be assured that all other types of appropriate therapy have been given an adequate trial. Depressed states—for example, involutional melancholia —often respond to psychotherapy; or, when this fails, to electroshock therapy. Only when these two measures have been unsuccessful should psychosurgery be considered. On the other hand, the reactive type of depression that accompanies advanced Parkinsonism seldom responds to psychotherapy or electric shock therapy, possibly because of profound organic changes throughout the brain. Psychosurgery, therefore, is often a useful answer to a situation of this kind.

* Professor of Neurological Surgery, College of Physicians and Surgeons; and Director, Service of Neurological Surgery, The Neurological Institute, Presbyterian Hospital, New York.

By the same token psychosurgery should not be performed for relief of pain due to cancer if it is possible to afford relief by spinothalamic cordotomy (2), except in some patients who suffer from extreme anxiety because of the nature of their affliction and/or their personality matrix. Since drug addiction in cancer patients can often be relieved by psychosurgery, the latter may be helpful for those who require narcotic dosages that lead to an almost perpetual state of somnolence. On the other hand it is scarcely ever worthwhile to subject a person to psychosurgery when life expectancy is only a matter of two or three weeks.

TYPES OF PROCEDURE

The different surgical procedures to be considered, all of which can be carried out under local or general anesthesia, are as follows:

1. *Lobotomy:* Frontal, bilateral or unilateral prefrontal, orbital, cingulate, or transorbital lobotomy and subcortical parietal lobotomy. There are several techniques for performing some of these procedures, as indicated in the next section.
2. *Topectomy:* Selective limited ablation of frontal lobe cortex, carried out symmetrically and bilaterally.
3. *Topartomy:* Topical ligation of the prefrontal arteries.
4. *Focal injection* of Novocain, procain, saline or other substances within the white matter of the frontal lobes.
5. *Focal electrical stimulation* of the deep midline frontal lobe areas by permanently implanted induction coils, or by wires led out through the scalp, attached to small silver electrodes permanently implanted within the brain.
6. *Thalamotomy:* Cauterization of the dorso-median nuclei of the thalamus by stereotaxic technique (3).

DISCUSSION OF PROCEDURES

1. Lobotomy

(a) *Frontal lobotomy* was first reported by Moniz in 1936 (4) and consisted initially of alcohol injection into the white matter of each frontal lobe for the alleviation of psychotic states. Later Moniz and Lima developed a small cutting instrument called a leucotome to interrupt fibers of the white matter. This procedure, carried out through trephine openings near the coronal suture, was called a leucotomy. Freeman soon introduced this procedure to North America where it was modified by him and Watts (1) and called a frontal lobotomy. Through trephine openings, a spatula-like instrument was introduced into each frontal lobe in order to cut through most of the white matter close to the plane of the coronal suture.

(b) *Prefrontal lobotomy:* Since this rather extensive sacrifice of frontal lobe connections often led to marked intellectual and emotional impairment, and sometimes to lasting urinary incontinence, less radical procedures were sought, by which quadrants (5) of the frontal white matter were sectioned, or more anterior (prefrontal) lobotomies were performed bilaterally (1) or unilaterally

(6). These operations generally proved therapeutically effective, without the disastrous consequences that sometimes followed the more radical frontal lobotomies.

(c) *Orbital and cingulate lobotomy:* Interruption of the connections to the subfrontal or orbital gyri (orbital lobotomy) (7) or undercutting of these gyri (8) has effectively relieved pain or anxiety without crippling complications, as has also cingulate gyrus isolation (9).

Any of these procedures can be carried out through ordinary trephine or burr openings, through larger trephine openings as reported by Poppen (10), or by an open technique through a small craniotomy flap. The latter approach offers better visualization of the brain and hence more accurate and more complete sectioning of white matter. The open technique was first described by Lyerly (11) and is used by Scarff (6).

(d) *Bimedial lobotomy by electrocautery:* Grantham (12) devised a special needle to destroy frontal white matter (usually the medial portion bilaterally) by electrocauterization. In the experience of the author the results of this procedure may be somewhat unpredictable unless the effects of cauterization are tested during the operation. This is made possible by performing this type of lobotomy under local anesthesia; thus the emotional changes can be evaluated at once. The necessity of a second procedure, or the risk of too radical an initial procedure, may thus be avoided.

(e) *Transorbital lobotomy*, introduced to, and extensively practiced in America by Walter Freeman, is accomplished by thrusting a spike-like instrument through the thin roof of the orbit just above the eyeball, while the patient is unconscious as the result of electroshock (13) or general anesthesia. By moving the instrument in different planes at different depths, sufficient white matter of the frontal lobes can usually be divided to produce a prefrontal lobotomy effect. In competent hands the complications and mortality rate following this procedure are surprisingly low, being in the neighborhood of 1 per cent. The two major drawbacks of transorbital lobotomy are the fact that it is a blind procedure, so that occasionally a fatal hemorrhage occurs, and the fact that it may not section enough white matter to be effective. It can be recommended, however, for its relative ease of performance and freedom from complications.

(f) *Subcortical parietal lobotomy* or wide undercutting of the parietal lobe white matter has proved highly effective in relieving the phantom-arm syndrome without creating personality disturbances (14). It is recommended only for an upper extremity phantom syndrome, when all other therapeutic measures have failed. (Spinothalamic cordotomy (2) usually relieves lower extremity phantom pain.) The parietal operation apparently disrupts sensory association pathways that serve to perpetuate phantom symptoms. Because no cortical scar is made near the motor area, convulsive seizures are not a problem, as they may be after cortical operations such as post-central gyrectomy (15).

2. Topectomy

Topical ablation of prefrontal cortex, carried out bilaterally and as symmetrically as possible for the relief of various types of mental and emotional illness has

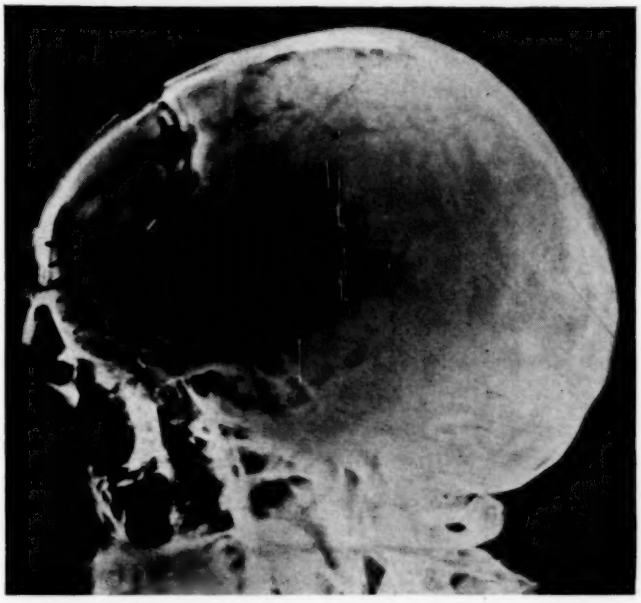

FIG. 1. *Topectomy:* Postoperative x-ray film showing position of small craniotomy bone flap. The site of bilateral cortical ablation is indicated by oblique shading. The vertical dotted line anterior to the coronal suture indicates usual location of a prefrontal lobotomy.

been called topectomy (16) or gyrectomy (17). This type of operation was devised by Burckhardt in 1891 (18), first performed by the author in 1946 (19), and reported by Penfield in 1947 (17). Topectomies are still used by the author because he feels that with this procedure it is possible to judge the location and the extent of the operation more accurately than in performing a lobotomy. In this regard it may be said that the *amount or quantity* of frontal lobe cortex removed by ablation or disconnected by lobotomy appears to be a more important factor in determining postoperative results than the actual anatomic location of the prefrontal surgery (20).

Despite the advantages of better visualization of the brain afforded by topectomy, this operation requires a transfrontal bone flap (Fig. 1) and takes more time (three hours) than does a lobotomy (one hour). Although topectomies are occasionally carried out under local anesthesia, general anesthesia is customary. Altogether, therefore, it is an operation of greater magnitude than lobotomy so that it cannot be recommended for debilitated Parkinsonian or cancer patients. However, it is still used by the author in preference to lobotomy for the treatment of mental illnesses, including depressed or involutional states in patients of advanced age, because of its better visualization of the brain which permits a more accurate type of procedure, and therefore less risk of intellectual impairment.

3. Topartomy

In 1948–49 the author deliberately sought to destroy or impair part of the prefrontal cortex without making any cut into the brain, by selective interference with

its blood supply (21). This was called topical arterial occlusion or "topartomy", and was carried out with good results in 6 of 7 depressed patients aged 60 years or over. Under local or general anesthesia a unilateral frontal burr hole 2.5 cm. in diameter was made close to the midline in front of the coronal suture, permitting transdural exposure of the falx cerebri. After incising the latter the medial surface of the opposite frontal lobe could also be exposed. With silver clips it was then possible to occlude the major prefrontal branches of each anterior cerebral artery and thus impair the arterial supply to the antero-medial portion of each frontal lobe, presumably representing portions of areas 9 and 10 of Brodmann (22). Although a relatively simple procedure, topartomy has not been continued because the desired cortical effects were considered too unpredictable.

4. Focal injection

Focal injection of frontal white matter via trephine openings has been tried by Van Wagenen (23), Orville Bailey (24) and others, using a local anesthetic agent, such as Novocaine or even physiologic saline, as an index of whether or not a subsequent lobotomy would be effective. Alcohol has also been injected with permanent therapeutic effects (4). Since the spread of such solutions is not predictable, this type of procedure has not been widely used.

5. Focal electrical stimulation

Focal electrical stimulation of deep midline frontal lobe structures is a new technique that is now being used more and more frequently—so far, with remarkable success and safety, without the production of convulsions. Permanent electrodes are inserted or implanted at the desired area deep within the brain by a direct operative approach (25) or by a stereotaxic apparatus (26). Wires from these implanted electrodes may be connected to a miniature induction coil set permanently in an opening in the calvarium (Fig. 2), or may be connected to fine insulated wires led out through the scalp for purposes of direct stimulation and also recording (Fig. 3).

The writer was the first to use a permanently implanted stimulation system in the human, when the method was employed to stimulate the femoral nerve of a paraplegic patient in 1945–46 (27). He was also the first to insert permanent electrodes in the human brain for purposes of stimulation (25), when in 1948 an induction-coil system was used to activate the caudate nucleus in a depressed cachectic woman of 60 suffering from advanced Parkinson's disease. For a period of eight weeks, stimulation was carried out almost daily at the insistence of the patient and her family, who said it made her "feel better." During this treatment she began to eat well, put on weight, and react in a more cheerful manner. The coil and wires remained in place for over three years without any ill effects (Fig. 2). Stimulation was discontinued only because one of the wires broke. The method was also tried in another case (psychotic) in 1948, stimulation of the cingulate gyri being attempted.

Since 1950 R. G. Heath and his colleagues at Tulane University Medical School have developed another technique of deep focal stimulation, is now described in monograph form (26).

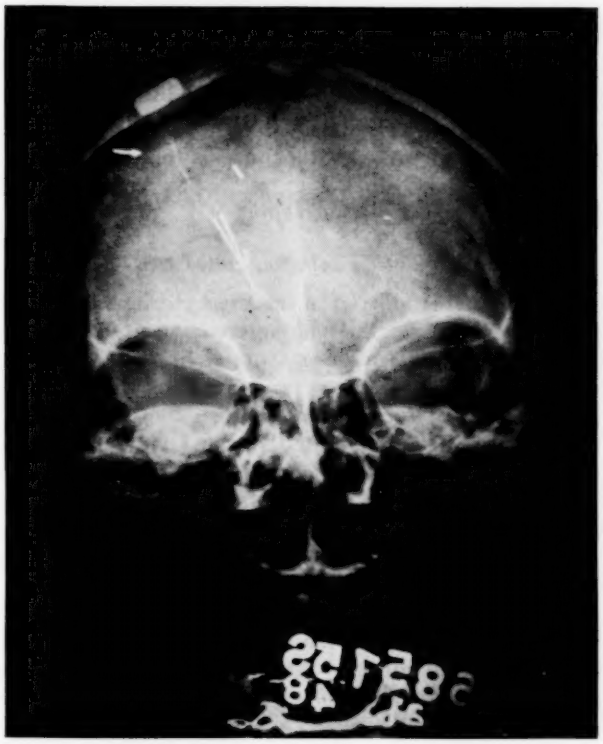

FIG. 2. Permanently implanted induction coil (circular object, upper left) implanted in skull for activation of electrodes within right caudate nucleus (see text).—Pool, J. L., Dec. 1948.

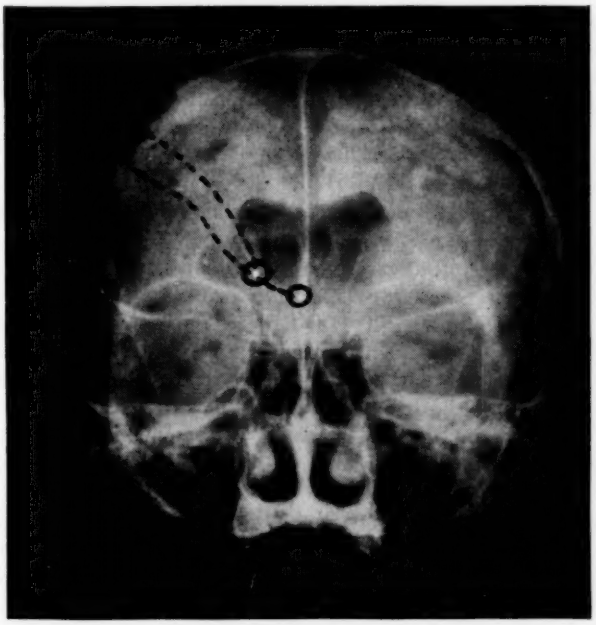

FIG. 3. Pain relief after focal brain stimulation with permanently implanted silver electrodes deeply placed in posterior portion of right frontal lobe (see case report, Mrs. G.). Electrodes are outlined with circles. Dotted lines indicate course of fine wire connections. Dec. 1953.—Method of R. G. Heath *et al.* of Tulane Univ. Medical School (27).

A trial of Heath's method by the writer in December 1953 is described, not only because the patient is in the age group under discussion, but because of the clinical improvement and pain relief thus far:

Case Report

(Focal stimulation with implanted electrodes)

Mrs. G., 61 years of age, was readmitted to the Presbyterian Hospital in November 1953 as a patient of Dr. Albert Grokoest. She had suffered for six months from progressively severe pain in both shoulders and arms accentuated by motion. About twelve months previously, bilateral median nerve decompression at the wrists had been successfully performed by Dr. John E. Scarff for relief of pain in the distribution of those nerves. Biopsy of adjacent tendon sheaths at that time revealed evidence of amyloid disease. Her clinical course, physical findings and laboratory data during the ensuing year confirmed the diagnosis of amyloidosis with presumable involvement of peripheral nerves, the gastrointestinal tract, liver and possibly the kidneys. A recent bone marrow biopsy indicated "multiple myeloma," which is now thought to be the fundamental disease entity underlying or associated with the amyloidosis. A previous marrow biopsy had given negative results.

During the six preoperative weeks in the hospital the patient suffered increasing arm pain, and progressive cachexia, together with an alarming degree of abdominal distention due to daily vomiting and total inability to retain food or fluids. Life was therefore maintained entirely by intravenous fluid administration, and it seemed that she would soon die.

For alleviation of arm pain and distress she required 650 mg. of Demerol per twenty-four hours.

Since Heath's work indicated that mild euphoria, alleviation of pain and drug addiction, and favorable alterations in body chemistry could be induced by deep frontal stimulation of the brain (without convulsive seizures), his procedure was elected for this patient.

Accordingly on December 23, 1953, under general anesthesia, two electrodes were placed deep in the right frontal lobe by stereotaxic apparatus under x-ray control, aided by a pneumoencephalogram. One electrode was placed close to the midline, anterior to the hypothalamus in the horizontal plane of the anterior commissure. The other lay in a more lateral, anterior and dorsal position (Fig. 2). The procedure was well tolerated, but there were no significant changes in her condition compared with the preoperative state until electrical stimulation was carried out.

Stimulation for sixty seconds was carried out on December 26, 1953, at 3 milliamperes, 50 cps, with square waves of 5 milliseconds pulse duration, using the same technique and apparatus as that tested on a similar experimental preparation. At weaker current strengths, no response of any kind was elicited. Stimulation at 3 ma. however immediately evoked a broad grin, the patient exclaiming, "Oh, Doctor, I feel so fine. My pains have all gone away." At the same time piloerection appeared over both arms, the pupils became slightly dilated, and respirations somewhat deeper and more rapid. No change in pulse rate or blood pressure occurred and the patient was able to talk and move all four extremities normally throughout the stimulation. Precisely the same phenomena occurred during a second stimulation of two minutes' duration, ten minutes later.

Ever since this stimulation, for over four weeks, there has been a drastic reduction in the Demerol requirement from 650 mg. to 50 mg. a day. There has been no further arm pain and she has been able to eat three meals a day. A mild degree of euphoria with no other change in personality, mood or intellectual capacity has been apparent.

Comment

It is the writer's conviction that focal controlled stimulation of the human brain is a new technique in psychosurgery that is here to stay, having potential advantages over lobotomy and other essentially destructive procedures by virtue

of the fact that it does not destroy brain tissue but nevertheless seems capable of yielding satisfactory therapeutic results. It may be administered to sufferers of certain severe chronic diseases or to psychotic patients. At present, however, this type of procedure should probably be used only in desperate cases in which there is virtually nothing else to offer.

COMPLICATIONS OF PSYCHOSURGERY

Permanent incontinence has not resulted from topectomy operations and is rare after prefrontal lobotomies as carried out in recent years. The incidence of postoperative seizures after topectomy in uncomplicated cases is approximately 10 per cent; and in all cases, including patients who suffered preoperative convulsions and those who underwent two frontal lobe operations, approximately 16 per cent. The seizure incidence after lobotomy, according to a recent review by Freeman, is close to 25 per cent, but others have reported incidences of 50 and 80 per cent. After transorbital lobotomy, however, the incidence is only 3 per cent. The operative mortality rate is less than 1 per cent for topectomy and transorbital lobotomy, and about 3 per cent for frontal or prefrontal lobotomy.

CHOICE OF PROCEDURE

1. Mental illness

By the age of 60 a patient suffering from chronic schizophrenia of any type can seldom be improved with regard to his psychosis, though psychosurgery may render him a more manageable and more tractable patient. To accomplish the latter effect a greater amount of frontal cortex must be disconnected or excised than is usual for relief of pain or less severe psychotic states and most depressions. A radical bifrontal lobotomy is generally the simplest and most effective procedure for obtaining tractability, although a transorbital lobotomy may prove satisfactory. Topectomy is not sufficiently radical.

A few illustrative case reports demonstrate the fact that psychosurgery can be effective without producing intellectual impairment:

1. Since topectomy, a business man of 61 who had been incapacitated for three years by a severe agitated depression, has been back at work for over a year as vice president of a large business firm, where he has been entrusted with important out-of-town deals which he has successfully negotiated. His associates state that he is working more effectively and behaving more naturally than he has in ten years.

2. A woman of 71, a sufferer for over five years from agitated suicidal depression despite the usual trial of psychotherapy and shock therapy, has been symptom-free for over four years since topectomy. She remains active and brilliant in her social life, and manages her own financial affairs.

3. Three other women of 65, suffering for years from suicidal depressions of involutional type, have all been restored to a wholly normal social life following topectomy, and another woman in a similar category, beset with a host of psychosomatic complaints, has been relieved equally well by bilateral prefrontal lobotomy. In this connection it should be pointed out that good results following

lobotomy do not differ from good results following topectomy. However, for reasons given previously, topectomy is generally preferred by the writer because it provides better exposure of the brain and hence less risk of inadvertently performing too destructive an operation that might eventuate in serious intellectual impairment.

2. Chronic illness

Patients with reactive depressions secondary to pain, rigidity, incapacity or other effects of chronic disorders like Parkinson's disease usually derive considerable though not complete relief from their suffering and depression after appropriate psychosurgery, so that they can eat, sleep and enjoy life better. Since these patients are so often physically debilitated by their diseases they constitute serious operative risks, particularly with respect to myocardial failure in the presence of arteriosclerosis, and postoperative pneumonia. Hence a procedure should be elected that can be completed rapidly, preferably under local rather than general anesthesia. Since the disease itself, or arteriosclerotic changes, has so often led to widespread brain damage, it is important in this group of patients to avoid too extensive an operation, for the cerebral margin of safety is far less than in most younger candidates for psychosurgery. For these reasons, the author prefers to perform a unilateral or bilateral lobotomy under local anesthesia through a small trephine opening forward of the coronal suture. A spatula (1, 6, 10) or Grantham coagulating needle (12) can then be used for destruction of white matter, step by step, until there is obvious relief of symptoms such as anxiety or pain. Transorbital lobotomy may prove equally effective in such cases but the operator cannot judge the effects during the procedure. Topectomy is too extensive a procedure for such patients. Thalamotomy may also be considered (3).

3. Cancer pain

For pain relief and drug addiction due to cancer the same criteria as those just enumerated apply for the selection of the operative procedures. In patients suffering from malignant invasion of the base of the skull, effective alleviation of pain can be achieved by sectioning the posterior root of the trigeminal nerve and performing an ipsilateral prefrontal lobotomy at the same time. It may be, however, as Heath has shown (27), that deep focal stimulation of the brain will be an even more satisfactory means of alleviating the pain, anxiety and cachexia of the cancer victim, than lobotomy or ablation operations.

A number of factors determine the choice of procedure in psychosurgery, to wit: the nature of the illness; the physical condition of the patient such as the cardiovascular and pulmonary capacity and state of nourishment; his intellectual capacity and expectations for the future; the extent of existing cerebral atrophy or pathology; and the individual preference and aptitude of the operator.

CONCLUSIONS

1. Psychosurgery may be performed successfully in older persons for relief of certain types of mental illness and pain.

2. It should not be used unless all other types of appropriate treatment have been tried first.

3. Older persons with depressed states respond most satisfactorily to psychosurgery; those with chronic schizophrenia, the least well; and those with manic-depressive states, occasionally.

4. Pain due to cancer together with anxiety and drug addiction, may also be relieved by an appropriate type of psychosurgery in older people.

5. Various techniques of psychosurgery are outlined, including promising newer methods such as deep focal stimulation of the brain. These methods include: frontal, prefrontal, fractional and cingulate lobotomy or leucotomy; transorbital lobotomy; undercutting; ablation procedures such as topectomy or gyrectomy; focal arterial ligation (topartomy); thalamotomy; injection techniques; and deep focal electrical stimulation of the brain with permanently implanted electrodes. The latter is capable of relieving pain for relatively long periods without the production of ill effects or convulsive seizures. Since it is not a destructive procedure, intellectual capacity is not threatened as may be the case following some of the other techniques.

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SURGICAL TREATMENT OF TRIGEMINAL NEURALGIA IN THE OLDER AGE GROUPS

HENRY W. DODGE, JR., M.D., AND J. GRAFTON LOVE, M.D.

Section of Neurologic Surgery, Mayo Clinic and Mayo Foundation, Rochester, Minnesota*

Any discussion of the methods of surgical treatment of trigeminal neuralgia (lancinating paroxysmal pain in one or more branches of the fifth cranial nerve) in the older age groups is in essence simply a consideration of the disease as it occurs, for trigeminal neuralgia is primarily an affliction of older persons.

Although in a large neurologic or neurosurgical practice trigeminal neuralgia, variously termed "Fothergill's disease," "tic douloureux" or "trifacial neuralgia," is not a rare condition (approximately 200 patients a year for the past ten years have been treated for it at the Mayo Clinic), this disease is still relatively uncommon in the general population.

A large number of patients complaining of "pain in the face" may be relieved by simple measures dictated by careful preliminary diagnostic evaluation. Typical tic douloureux (trigeminal neuralgia) presents such a striking, unforgettable picture that the diagnosis is usually not difficult. However, unilateral or bilateral facial pain resulting from other causes and having some ticlike characteristics may be confusing and the relief of pain offered by ill-advised surgical treatment disappointing. Therefore, despite the seeming urgency dictated by severe pain, it is often rewarding to employ temporizing measures (narcotics and so forth) in order to allow adequate clinical investigation.

The etiologic basis for primary (major) trigeminal neuralgia is as yet indeterminate, that is, presently there is no proved organic cause. Severe neuralgic facial pain may be experienced as a secondary manifestation of organic involvement of the fifth cranial nerve in its central or peripheral distribution. Careful general and neurologic examination, roentgenologic survey, blood serologic tests for syphilis, and routine and special laboratory tests may reveal the painful facial affection to be the result of a demonstrable organic lesion.

Primary tumors may occur on the fifth cranial nerve or in adjacent areas in the posterior cranial fossa (pons, brain stem), along the gasserian ganglion in the middle cranial fossa, and along the peripheral branches innervating the face. Metastatic neoplasms or secondarily invasive nasopharyngeal tumors similarly may affect the nerves (Fig. 1). Aneurysms of the internal carotid artery and other vascular anomalies, inflammatory lesions of meninges, nervous tissues, neighboring bone or air sinuses, toxic or metabolic dysfunctions, and congenital or post-traumatic structural defects contribute to the wealth of organic lesions which have been known to incite facial neuralgia and are "discoverable."

Arteriosclerotic or thrombotic lesions of the thalamus and brain stem are associated with pain of this type. Severe neuralgia in the distribution of the trigeminal nerve may follow an attack of herpes zoster. Migraine headache, the

* The Mayo Foundation is a part of the Graduate School of the University of Minnesota.

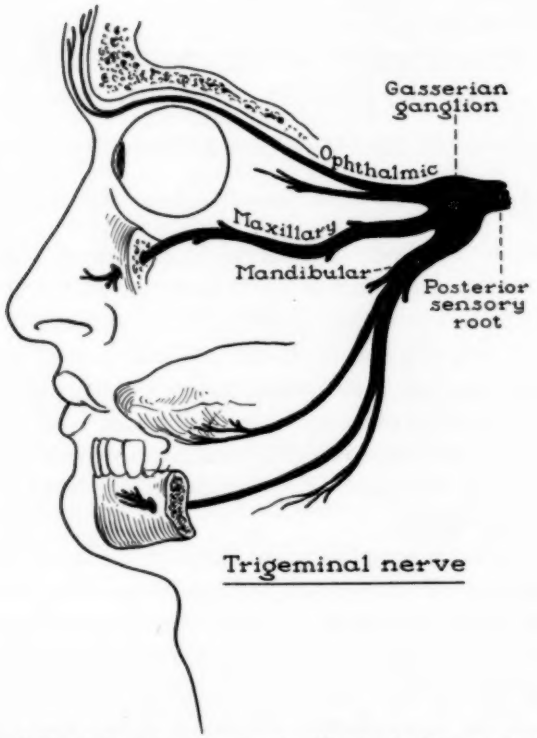

FIG. 1. Diagram of the trigeminal nerve to illustrate the posterior sensory root, the gasserian ganglion lying in the middle cranial fossa, and the three major divisions, namely, the ophthalmic nerve, the maxillary nerve and the mandibular nerve.

vasodilating syndromes, and major glossopharyngeal neuralgia as well as the occasional neuralgic facial pain that occurs as a manifestation of emotional conflict, all lend emphasis to the importance of careful diagnostic screening of patients.

Once accurate diagnosis has been established the patient may derive comfort and reassurance in the knowledge that there are safe and adequate surgical means for the relief of trigeminal neuralgia. There is nothing more satisfying to the physician or surgeon than the grateful patient who has been delivered of his trigeminal pain, nor more distressing than the postoperative patient who through inadequate preliminary total evaluation has failed to show the anticipated relief.

DIAGNOSIS

Major or primary trigeminal neuralgia usually affects patients in later years, that is, in the fifth and sixth decades of life (the oldest patient operated on at the Mayo Clinic was 85 years of age). This terrible affliction can be encountered in young persons but it is not as frequent. The occurrence of trigeminal neuralgia as an early symptom associated with multiple sclerosis has long been noted. The simultaneous unrelated occurrence of these two conditions in the same individual seems worth investigating, however.

The pain of trigeminal neuralgia is ordinarily unilateral, but has been reported

to occur bilaterally in from 2 to 5 per cent of cases. Most commonly involved are the second and third (maxillary and mandibular) divisions of the fifth cranial nerve. The first (ophthalmic) division of this nerve is least often affected but it may be the site of more distress because of the difficulty of satisfactory local therapy and the emotional implications to the patient of feared visual loss.

Descriptions of the character of the pain by the unfortunate patient vary from representing it as "excruciating," "agonizing," "unbearable," "horrible," to likening it to an "electric shock," a "hot knife" or a "burning wire." To witness a patient in an attack is of infinitely more value than reading pages of learned description. Typically the pain is paroxysmal. It may occur at lengthy intervals or in almost paroxysmal status. There are, of course, gradations of severity. It is said that females are afflicted oftener than males, and that the paroxysms of pain occur more frequently on the right than the left side of the face.

Interseizure periods may be pain-free, or there may be some persistent dull ache or paresthesias. The paroxysms may occur spontaneously or they may be "triggered" by shaving or washing the face, chewing, talking, brushing the teeth, combing the hair and so forth. A sudden draft of cold air or unexpected change of environmental conditions near the affected side may cause a paroxysm of pain. The terrible nature of the pain is attested to by the number of patients who come for treatment having avoided combing their hair, or shaving, or washing their face on the side of the pain for days or months or even years. Unwillingness to chew, and reluctance to swallow often leads to unsuspected dietary deficiencies and dehydration. Many patients appear exceedingly apprehensive. Should the physician examine an elderly patient who is plump, well nourished, immaculate, with pleasant or jovial facial mien and complaining of severe, paroxysmal, painful facial tic—let him beware!

The unexplained seasonal exacerbation (spring and fall) of the affection and the patient's lack of teeth (most patients have had most or all of their teeth extracted in their search for relief) lend further confirmatory evidence to support the diagnosis, which is most often made on the basis of the anamnesis, the patient's description of the pain, and the lack of demonstrable neurologic deficit. A further bit of confirmatory evidence is the frequent presence of "trigger zones." These are small areas of skin or mucous membrane, most commonly at the base of the alae nasi or on the upper lip, the stimulation of which incites a typical paroxysm of pain.

Many patients can relate no particular incident that occurred prior to the first attack of pain, whereas others may indicate dental caries or infection (dentists often see the patient early in his illness), sinus trouble, or systemic febrile illness as a precursor. Statistically and pathologically, valid inciting causes for major trigeminal neuralgia are still unproved.

TREATMENT

With the exception of the use of sedatives, narcotics or certain rapidly acting volatile anesthetic agents for emergency or temporary relief during preliminary medical evaluation, the treatment of this disease is entirely surgical. There are

probably few clinical entities in which the maxim of "fitting the operation to the patient" is more apropos, since the majority of sufferers are elderly.

Actually trigeminal neuralgia and the problem of treatment have been known since ancient times, and Fothergill (1), in 1733, provided a recognizable description of the disease. Lengthy discussion of the long evolution of surgical therapy is mainly of historical interest and not germane to this discussion (2, 3). It suffices to say that the most commonly employed surgical treatment is directed toward interruption of the painful trigeminal pathways at three principal points: 1) the peripheral branches of the gasserian ganglion, that is, the ophthalmic, maxillary and mandibular divisions, 2) the gasserian ganglion itself, or the posterior sensory root in the middle or posterior cranial fossa, and 3) the central ramifications of the nerve in the brain stem (mesencephalon and medullar oblongata).

Injection therapy. Injection of the peripheral branches of the trigeminal nerve, employing either procaine hydrochloride or 95 per cent grain alcohol, may be accomplished at the site of the trigger zone, at the exit of the branches from their superficial foramina (namely supraorbital, infraorbital, mental) or at their point of exit through the foramina ovale and rotundum at the base of the skull (4). Deep injection of the ophthalmic division is inadvisable owing to possible serious visual disturbances resulting from injury to the closely proximate optic nerve (5).

Superficial infiltration with alcohol at the appropriate site is relatively easy but may afford only partial or transient relief of pain. Deep injection of alcohol is technically much more difficult, but if successful it may afford periods of relief varying from six months to a year. Rarely, considerably longer relief is experienced, even up to many years. There is always, of course, complete anesthesia to all modes of sensation in the distribution of the injected nerve (Fig. 2).

Although satisfactory results may be obtained through superficial injection of alcohol, it has been the experience of the members of the section of plastic surgery, who perform the injections of alcohol at the Mayo Clinic, that deep infiltration of the maxillary or mandibular nerve or both at the base of the skull has proved superior to peripheral superficial injection. Deep infiltration of the gasserian ganglion itself with alcohol is rarely undertaken because of the attendant risk.

Alcohol-injection therapy seems to be advantageous under the following circumstances: 1) in the elderly, extremely poor-risk patient with severe hypertension and cardiac, renal or other serious systemic disease; 2) to confirm the diagnosis in atypical neuralgia and allow the surgeon to be confident that pain will be relieved should section of the root later be deemed advisable; 3) to permit the patient, particularly the younger patient, to have the opportunity for a spontaneous remission (this will rarely occur) and to acquaint him with the numb, swollen, "woodeny" feeling which will be permanent if the root is sectioned; 4) to afford complete freedom of pain for sufficient intervals to permit improvement in the patient's general hygiene; and 5) in the patient in whom trifacial neuralgia has been of short duration and could be the premonitory warning signal of an organic lesion but in whom it is too early for such a lesion to have involved neighboring structures to allow diagnosis.

The disadvantages of local and deep injection of alcohol are the occasional

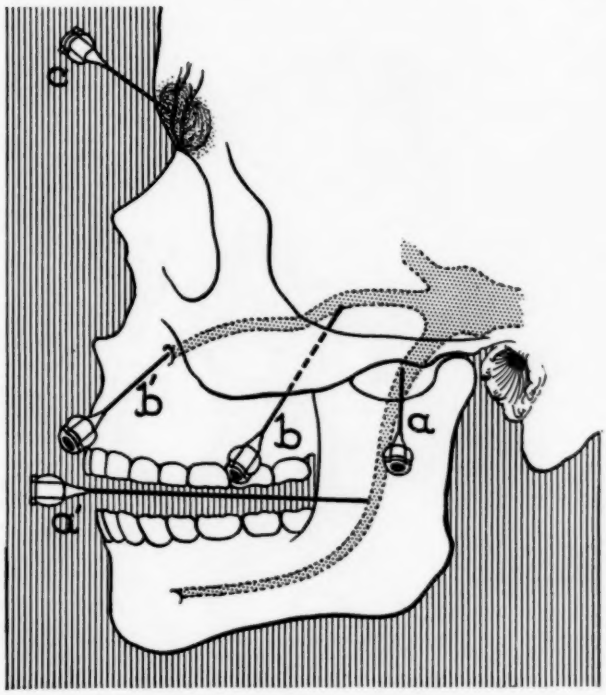

FIG. 2. Drawing of the trigeminal nerve to demonstrate the usual methods of superficial and deep chemical (alcohol) infiltration: *a*, injection of the mandibular division at the foramen ovale; *a'*, injection of the mandibular division at the foramen mandibularis; *b*, injection of the maxillary division at the foramen rotundum; *b'*, injection of the maxillary division at the infraorbital foramen; and *c*, infiltration of the supraorbital nerves (first division).

slough of tissues, the possibility of intractable alcoholic neuritis or burning paresthesias, the difficulty of deep injection even in expert hands, the necessity for repeated injections, and the inadvisability of attempting deep injection for first-division pain. Deep injection of alcohol is not without hazard, for inadvertent subarachnoid infiltration may produce serious cranial-nerve and ocular palsies.

Surgical therapy. Whereas the injection of alcohol is limited to the interruption of painful impulses in the maxillary and mandibular divisions at their superficial or deep foramina of exit and very rarely at the gasserian ganglion, surgical therapy may be employed at all three levels, namely peripheral, in the middle cranial fossa, and centrally. As with the development of any operative technic, numerous procedures have been tried in the past and discarded as risky or inadequate. There still remains, however, a wide variety of operations on the different levels of the peripheral and central parts of the fifth cranial nerve. These allow the surgeon a wide choice of procedures, and in truth he may fit the operation to the needs of the particular patient. For the operative relief of trigeminal neuralgia in elderly patients time, surgical familiarity and usage have emphasized the value of certain procedures and revealed the weakness or uncertainties of others.

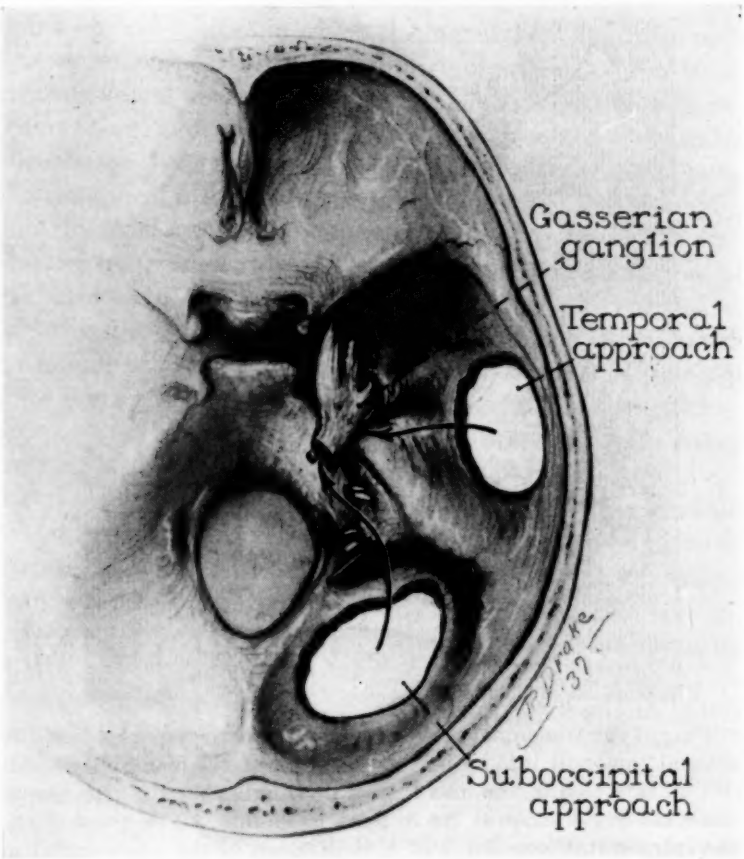

FIG. 3. The human skull, illustrating the areas of bone removed for approach to the posterior sensory root of the trigeminal nerve by way of the middle cranial fossa and by way of the posterior cranial fossa.

At the superficial foramina, the branches of the three principal divisions of the trigeminal nerve in the face may be crushed or avulsed. By transtemporal craniectomy and approach to the gasserian ganglion in the middle cranial fossa, the posterior sensory root may be divided either subtotally or totally, preserving the motor root to the muscles of mastication (6–9) (Figs. 3 to 6).

Approaching the posterior sensory root by suboccipital craniectomy one may likewise divide the sensory elements of the fifth cranial nerve on the appropriate side (10) (Figs. 3 and 7). In addition, the central connections of the trigeminal nerve may be attacked in the substance of the brain stem itself at the level of the mesencephalon (11, 12), or in the medulla oblongata (13) (Fig. 8).

Experience has demonstrated the transient relief from peripheral neurectomy and the increased morbidity and mortality that are associated with the posterior approach to the sensory root and with tractotomy in elderly patients, who by and large make up the group for which adequate and safe surgical therapy is desired.

The transtemporal retrogasserian sensory-root section devised by Frazier and Spiller (6–8) and popularized by them and others (9, 14–16) has through constant

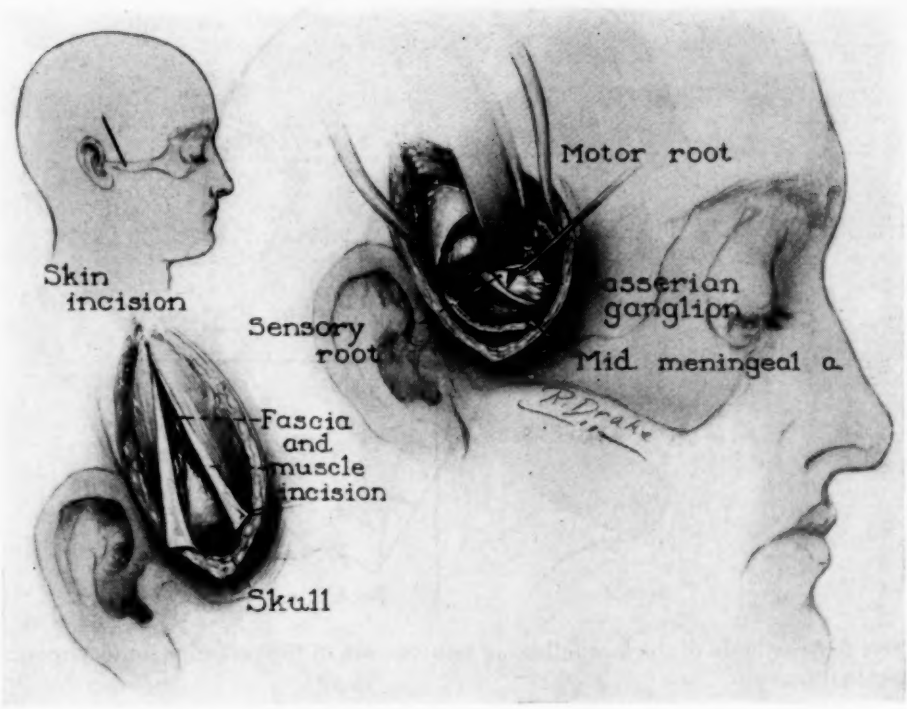

FIG. 4. Operative exposure of the right gasserian ganglion and posterior sensory root in the middle cranial fossa. Note the separation and preservation of the small motor root.

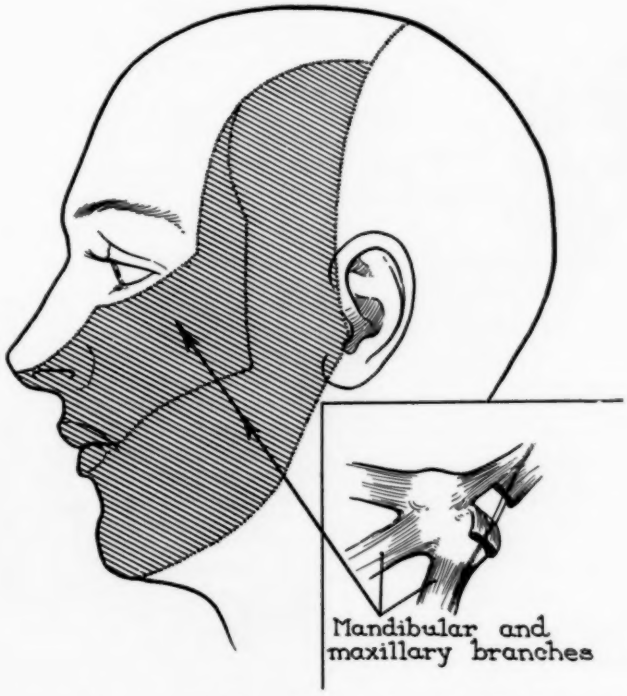

FIG. 5. Diagrammatic representation of subtotal section of the posterior sensory root of the trigeminal nerve, sparing the fibers of the ophthalmic (first) division. Shaded areas denote the resulting anesthesia.

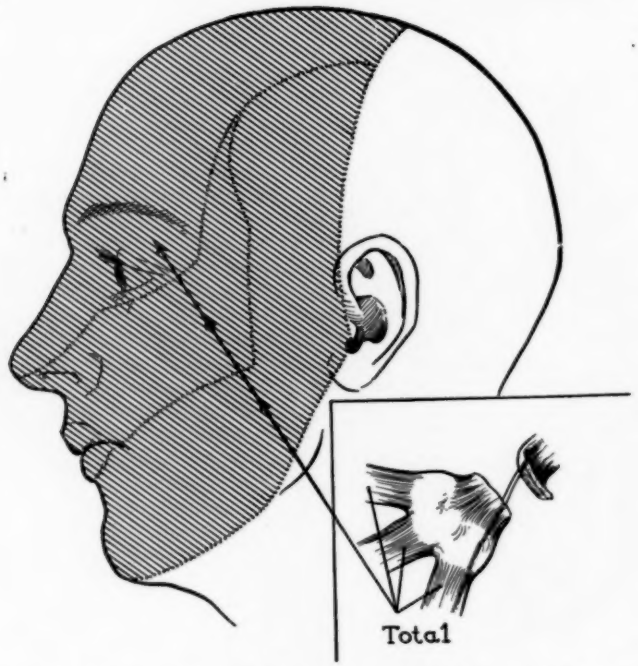

FIG. 6. Anesthesia of the face following total section of the posterior sensory root of the trigeminal nerve.

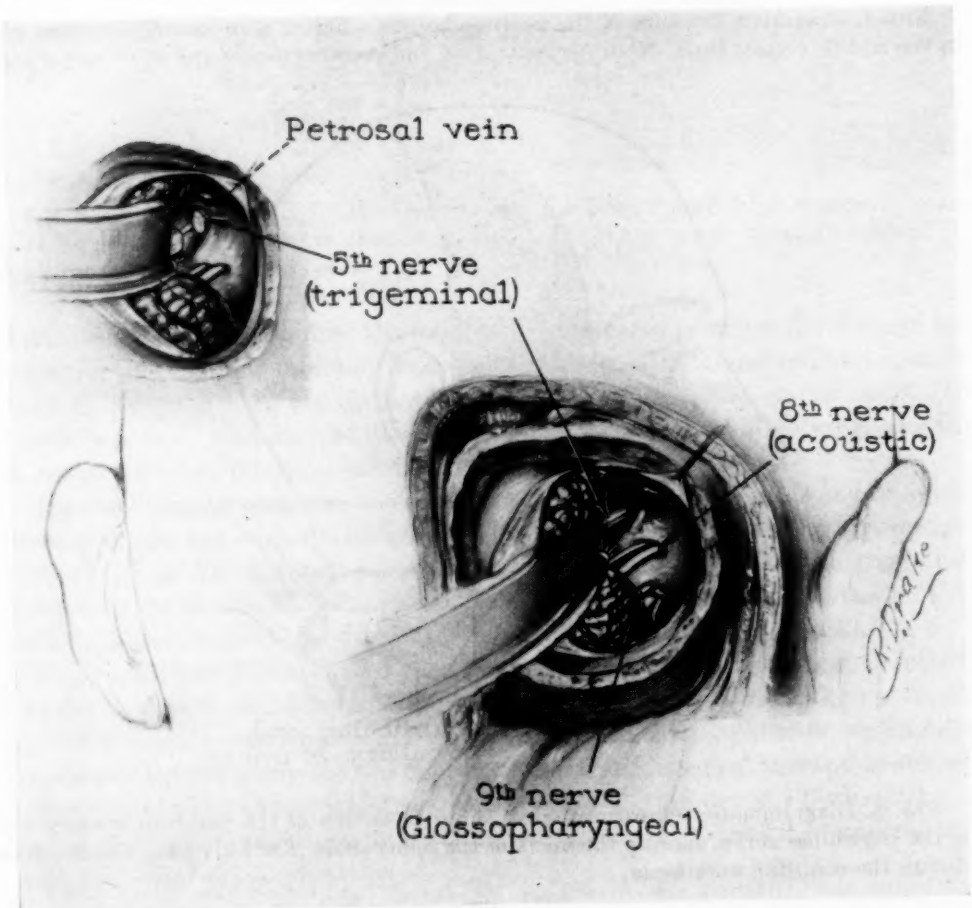

FIG. 7. Posterior approach (Dandy) by way of the posterior cranial fossa to the sensory root of the fifth cranial nerve.

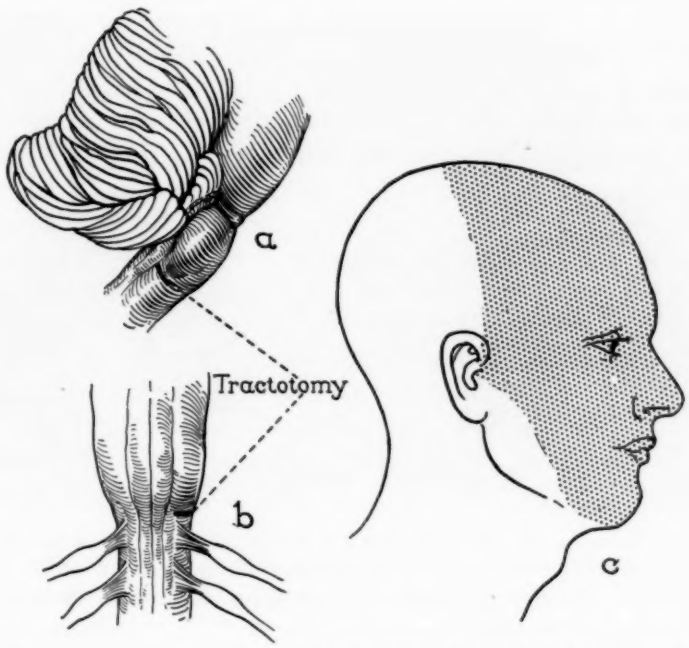

FIG. 8. Section of the descending tract of the trigeminal nerve in the medulla oblongata and resulting denervation of the face to pain and temperature. In the central connection of the fifth cranial nerve the pathways for pain and temperature are separate from sensation of touch. *a* and *b*. Incision into the descending tract of the fifth cranial nerve in the medulla oblongata in the posterior cranial fossa. *c*. Resultant denervation of the face to the modalities of pain and temperature.

use become refined to the point where, in experienced neurosurgical hands, the mortality rate should approach 1 per cent or less. When the age, condition and type of patients operated on by this method are considered, it is readily apparent why this operation is so universally employed.

Naturally when a nerve root or central nervous pathway has been surgically sectioned, neurologic deficit results. In the case of the patient with tic douloureux, the resulting anesthesia of one side of the face has usually been a welcome substitute for the agonizing paroxysms of pain.

The most troublesome problem following total section of the root is of course the anesthesia of the cornea on the involved side. Lack of corneal sensation makes the patient unaware of dust or particles that blow into the eye. Serious complications such as corneal ulceration and even visual loss can occur. The patient's glasses can be fitted with a dust shield and he can be instructed in the care of his eye; however, for farmers, laborers or persons who are employed in outdoor jobs, the corneal anesthesia may become an important problem. Subtotal section of the root (Fig. 5) was devised (8) to avoid the loss of corneal sensation, but in those patients in whom total section of the root is necessary, corneal anesthesia must be contended with.

The most recent development in the search for safer, more adequate technics has been the addition of decompression of the gasserian ganglion and the posterior sensory root of the trigeminal nerve. Previously it was always assumed that the

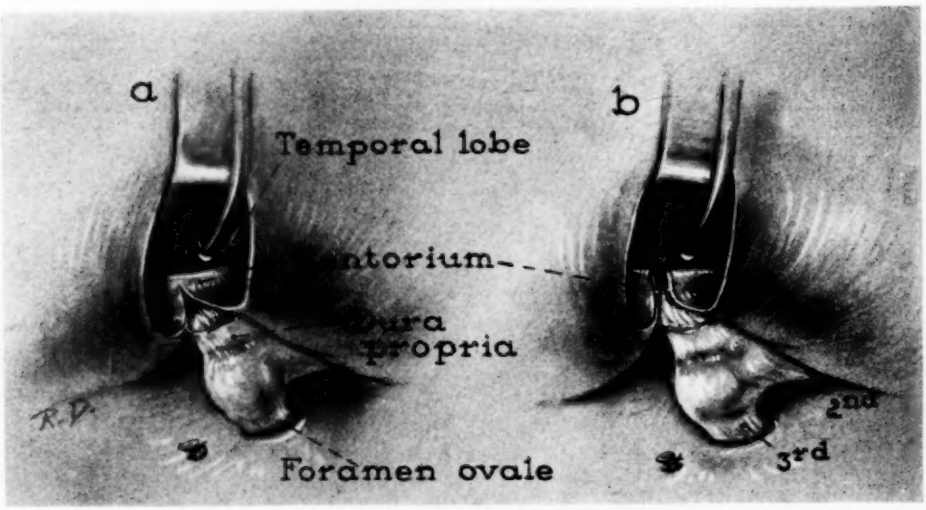

FIG. 9. Decompression of the gasserian ganglion and posterior sensory root, as it is employed at the Mayo Clinic. The operation depicted is the extradural approach, devised by one of us (Love), through the middle cranial fossa and is a modification of the procedure first described by Taarnhøj.

unfortunate patient afflicted with trigeminal neuralgia must accept neurologic deficit (that is, loss of sensation in the distribution of the trigeminal nerve) as a substitute for his previous agonizing paroxysms of pain. Trigeminal decompression, first advocated by Taarnhøj (17) and modified by Love (18), has made possible the relief of the pain while at the same time allowing the patient to maintain normal sensation in the face. Decompression of the gasserian ganglion and posterior sensory root consists in unroofing the gasserian ganglion as it lies in Meckel's cave in the middle cranial fossa, and splitting the dural covering over the posterior sensory root as it passes back from the ganglion and crosses the bony petrous ridge into the posterior cranial fossa and brain stem (Fig. 9).

Why this particular operation should relieve pain is somewhat of a mystery, but the best evaluation seems to suggest that constricting dural bands along the bony petrous ridge may induce the necessary circulatory or reflex nervous changes to cause trigeminal neuralgia. The intermittency of symptoms remains unexplained.

The advantages of an operation which relieves trigeminal pain and yet permits sensation in the cornea, the skin of the face and the mucous membranes of the mouth to remain normal are immediately obvious. Aside from the lack of necessity for eye care, dentures are better tolerated, and buccal erosions, lip biting and so forth are not problems. That the procedure may be performed transtemporally by the extradural approach with equal or less morbidity and mortality than are associated with section of the posterior sensory root adds to the attractiveness of the procedure both to the patient and surgeon.

Since this operation is relatively new (17, 18), knowledge of the length of relief of pain is incomplete. The pain may recur in some patients. If it does not

recur, they have benefited greatly. Should pain return, deep injection of alcohol or section of the posterior root may always be performed.

It has been our experience that the extremely poor-risk elderly sufferer may be handled best with peripheral or deep injections of alcohol. The wise practice of performing, prior to operation, at least one deep block with alcohol on all patients who have trigeminal neuralgia, to allow the patient the opportunity to become acquainted with loss of sensation, has been rewarding. Often after one or two injections, the patient returns and requests an operation.

In the late middle-aged and elderly patient, total or subtotal section of the root by the transtemporal approach has been exceedingly satisfactory, although there are, as with any surgical procedure, certain occasional difficulties. These have in the main consisted of corneal ulceration, facial or ocular palsies, herpes simplex of the lips, mental confusion or transient weakness of one side from retraction of the temporal lobe. Disturbing paresthesias occasionally are experienced, some transient, a few permanent. These rarely may prove as annoying as the previous pain.

When the age, hygiene and general physical condition of many of the candidates are considered, the operative complications are remarkably few. Most elderly patients tolerate the transtemporal approach to the fifth cranial nerve in a gratifying fashion.

Decompression of the posterior root of the ganglion carries the same inherent surgical risks as those posed by section of the nerve root but lacks the postoperative problem afforded by loss of facial and corneal sensation on the involved side. Except under special circumstances it has not seemed wise, in our opinion, to subject the elderly patient to the increased risk of mesencephalic, medullary tractotomy or section of the posterior sensory root in the posterior cranial fossa.

The preoperative and postoperative care of a relatively large group of elderly patients suffering from major trigeminal neuralgia reveals certain problems. Many of these patients come for treatment inadequately fed, dehydrated, nervous, apprehensive, pain-racked and debilitated. Under such conditions, the patient at operation may undergo anesthesia extremely poorly. Subclinical dietary deficiencies may cause prolonged bleeding time (occasionally not detectable by ordinary methods), hinder accurate hemostasis, and increase the danger of postoperative hemorrhage.

During surgical intervention, balanced endotracheal anesthesia that allows an unobstructed airway and employs large amounts of oxygen, minute-to-minute control of blood pressure (sudden pronounced falls in blood pressure may be hazardous and are apt to occur in elderly patients, who are generally operated on in the upright position), and intravenous administration of fluid or transfusion of whole blood are all important contributions to the total welfare of the patient.

The wounds in protein-poor, dehydrated patients may not heal kindly, and blood-electrolyte patterns may be so disturbed that serious imbalance results in the postoperative period. The mental confusion which occasionally is seen in the early postoperative course has been ascribed to the after-effects of retraction of the temporal lobe for surgical exposure. It is not uncommon, however, to see

this confusion rapidly clear when adequate hydration and electrolyte balance are achieved. Determination of the blood urea nitrogen level and studies of fluid balance (liquid intake and urinary output) are helpful. An indwelling urethral catheter for a day or two after operation if necessary can add immeasurably to the comfort of the patient, the accuracy of fluid regulation and the dispositions of the nursing staff.

Restlessness, apprehension, depression and the rare psychotic episodes encountered in elderly postoperative patients may be handled satisfactorily by the judicious use of sedatives. It is helpful to remember that in the presence of pain, the barbiturates may act adversely to make the patient excited and disoriented. Often the complete discontinuance of all sedatives and the employment of 5 to 10 grains of aspirin radically changes the patient's course for the better.

Restlessness due to the postoperative presence of blood in the subarachnoid space should be relieved by careful lumbar puncture. Restlessness from a full bladder occurs and should be recognized. Small doses of dexedrine or dexamyl are helpful for some patients with postoperative depression, as is frequent reassurance by the surgeon. Early ambulation has a distinct physiologic and psychic benefit. A small fresh clean bandage is also helpful for purposes of morale.

Probably the single most important aid to the satisfactory handling of mature, intelligent, elderly patients with tic douloureux is kind, considerate and thoughtful attention on the part of the surgeon and his assistants. For the apprehensive elderly patient who is exhausted from pain, from the effort of getting to the doctor, and from fear of the unknown—surgery—the relief afforded by heavy sedation or at times even alcohol block allows adequate preliminary alimentation, hydration and general evaluation so that safer, surer treatment, smoother convalescence and greater satisfaction on the part of the patient are afforded.

A present-day evaluation of the treatment of trigeminal neuralgia must conclude that time, experience, imagination and medical endeavor have provided safe, sure and satisfactory methods of successfully handling the multiple problems presented by paroxysmal facial pain in an ever enlarging and important social group—the elderly patient.

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MALIGNANCY OF THE EAR, NOSE AND THROAT IN OLDER PEOPLE

DAVID W. BREWER, M.D.*

The Department of Otolaryngology, State University of New York, Upstate Medical Center, Syracuse, N. Y.

How often a patient comes into the office with seemingly minor complaints, is examined, and only afterwards expresses deep concern over the "previously" possible presence of malignancy. Symptoms somewhat similar to those of a relative or friend who recently has succumbed to malignant disease has prompted the visit. The physician is unaware of this background; yet, how often he finds himself in the difficult situation of either minimizing the possible significance of the presenting symptoms and signs or of requiring expensive and perhaps, at the time, ill afforded laboratory or other consultations in order to rule out, as completely as possible, the presence of such disease.

Since no single individual's experience is infallible in dealing with malignancy, a group opinion is much to be desired. More Medical Centers, both large and small, are establishing Tumor Clinics and Tumor Boards to review findings in individual cases and to present group opinions. In conjunction with these innovations, Head-and-Neck Sections or Services are being set up in Hospital Staffs to cope with the problems included in this wider field. Otolaryngologists, oncologic surgeons, plastic surgeons, prosthetists, internists, radiologists, pathologists, anesthesiologists and laboratory experts are all major contributors in the team approach to the treatment of malignancy in these anatomic areas.

With ear, nose and throat problems forming an estimated average of 25 per cent of a general practitioner's work, with malignancies of the head and neck comprising approximately 2 per cent of most Tumor Clinic cases, and with a continuing increase in longevity, a review of differential methods of diagnosis of lesions in this area is pertinent.

THE EAR

Six major complaints with regard to the ear may be associated with malignant disease: pain, discharge, hearing loss, ringing, dizziness, and cranial nerve weakness or paralysis. When does each of these, or a combination, suggest the need for further search for malignant disease?

Pain, rarely of sudden onset, deep-seated in the temporal region, comes late in malignant involvements. Lack of visible signs of a lesion quickly directs attention to the possibility of its being metastatic.

Discharge, especially if bloody, may stem from weeping of a local lesion such as a basal-cell or squamous-cell carcinoma of the auricle or external auditory canal, or may be caused by secondary infection of a tumor involving the middle ear or other portions of the temporal bone.

Unilateral *hearing loss* frequently is difficult to evaluate without the aid of a carefully performed hearing test and audiogram. However, a recently noted hearing loss, especially when associated with other ear symptoms, may be a result of malignant disease.

Ringing or tinnitus, either constant or throbbing, may be present. It is also unreliable as a diagnostic symptom, for it may simply be a manifestation of a degenerative disease, such as arteriosclerotic involvement of one of the branches of the internal auditory artery, or it may be the result of recent exposure to loud noise, or acoustic trauma. It may also be caused by Eustachian tube blockage secondary to allergy, and be totally unrelated to a malignant process. Complete examination should aid in the differentiation, but without the proper instruments and training this is not feasible in an office equipped for general practice.

Dizziness, a term so loosely used by patients, often is not representative of true vertigo with its sensation of rotation of environment or of the individual in relation to his environment. Labyrinthine vertigo may be due to primary or metastatic malignancy. Careful questioning and examination will distinguish true vertigo from its many masqueraders. However, without the aid of labyrinth testing by the calorigram or mild water-stimulus technique, and in the absence of spontaneous nystagmus, a diagnosis of labyrinthine involvement can only be presumptive. An additional diagnostic sign is the association of frequent falling in the same direction as the quick component of the nystagmus.

Cranial nerve involvement may be of either slow or sudden onset. Facial weakness, weakness of the lateral rectus, weakness of the tongue with protrusion to one side, or difficulty in swallowing (especially liquids) with or without choking, are suggestive signs and need further evaluation by neurologic and x-ray examinations.

The diagnosis of tumor ultimately depends on the report of the pathologist after his examination of the biopsy specimen or the auricular tissue removed during treatment. The biopsy procedure frequently leads to secondary infection, when the lesion is limited to the auricle.

Radiologic consultation is of great importance in determining the extent of the lesion, but radiologists carefully trained in otolaryngologic diagnosis are often difficult to find.

X-radiation of skin lesions, closely applied over cartilage, leads to severe pain and poor results. Therefore surgical removal of auricular lesions is the method of choice at present. Lesions of the external auditory canal, middle ear, and mastoid require radical mastoidectomy. Both radium and x-radiation have their place in the treatment of these lesions postoperatively, but results by all presently available methods are far from satisfactory. Radical removal of the entire temporal bone is being used in at least one large center at present, but reports are not yet available as to the results.

With the marked advance in the use of prostheses, plastic ears are available, which look and feel very much like the undiseased original and play a significant part in the patient's rehabilitation.

Each patient's problem must be judged on its merits and due consideration

given to the type and extent of the tumor, and the degree of involvement of skin, cartilage and bone before the consulting specialist can advise as to the method of treatment.

NASOPHARYNX

Most symptoms produced by malignant growths in this area are referred to adjacent areas. In roughly one quarter of these tumors, the first and only sign is a non-tender node in the neck. Biopsy of the node without previous careful examination of the nasopharynx is a pitfall to be avoided. It allows the primary site (often submucosal and difficult to find) to remain hidden and unrecognized and may also allow additional spread before therapy can be instituted. Careful examination of the nasopharynx is very difficult in the general physician's office. A postnasal mirror usually is not part of his equipment, but only by its frequent use can landmarks be quickly and easily recognized. The essential use of topical anesthesia, the soft-palate retractor, and the nasopharyngoscope are remembered as mysteries from medical school days rather than regarded as the daily routine of the otolaryngologist.

In another one quarter of these malignant growths the initial aural symptoms are persistent unilateral blocking and stuffiness, mild hearing loss on the same side, and sterile fluid in the middle ear with the characteristic amber retracted drum, prominent short process and chalky white handle of the malleus. Occasionally a fluid level is present, but far more often the foregoing findings are associated with a full tympanum.

In about one quarter of these tumors there are eye symptoms, with unilateral weeping and injection; later there is limitation of motion, cycloplegia and exophthalmos. The ophthalmologist's opinion is usually first obtained by the patient.

In the remaining one quarter there are nasal symptoms of unilateral nasal obstruction and one-sided nasal discharge, bloody on occasion and often foul.

Later stages, with involvement of the base of the skull and intracranial extension, present additional symptoms of cranial nerve and cortical cerebral disturbance as a result of the tumor and superimposed secondary infection.

Diagnosis is established by biopsy of the primary lesion. Careful study of the extent of the lesion by means of x-ray examination of the base of the skull and of the nasopharynx is essential.

Early diagnosis and early irradiation at present offer the best chance for survival, since these tumors are most often rapidly growing. With x-radiation directed to the primary site in the nasopharynx and neck, and the insertion of radon seeds for treatment of cervical nodes, the outlook for these patients is much brighter than formerly.

NOSE AND SINUSES

Mitotic lesions of the nasal and paranasal cavities also may present initially as symptoms directing the physician's attention to adjacent areas. Blocking of the sinus ostium or of the nasolacrimal duct may at first lead one to suspect an infected sinus, tooth or eye as the sole cause.

Careful identification of all intranasal structures with the use of a head mirror

and nasal speculum after adequate nasal shrinkage is essential. Transillumination of the sinuses is only a rough test for sinus involvement and any deviation from the normal requires careful x-ray examination and interpretation. Again, accurate diagnosis depends upon the report of a trained pathologist, and radiologic consultation is essential to help establish the extent of the disease. A simple nasal polyp, especially in older patients, too frequently is found by microscopic examination to be malignant rather than benign.

Unilateral nasal blockage and bloody or foul discharge, in the absence of a foreign body, are suspicious findings and should spur the examiner to redouble his efforts in establishing the cause.

Secondary infection of the sinuses, or tumor involvement of the nerve endings lying in their mucosal linings leads to headache and pain. Generally, maxillary sinus involvement directs attention to the teeth first and foremost. Pain in more than one tooth is very suspicious and pain about the eye, swelling of the cheek and homolateral nasal congestion must be carefully investigated. Pain across the bridge of the nose, eye pressure and bitemporal headache point to an ethmoid sinus condition. Pain over the eye, and tenderness in the supraorbital area and over the floor of the frontal sinus makes this sinus (or its drainage tract through the nasofrontal duct) a possible harbinger of malignant disease; or it may be secondary infection in the sinus with the primary lesion in the middle turbinate of the nose. Posterior ethmoidal malignancies fortunately are few, as are primary malignancies of the sphenoid, yet they may be the site of secondary infection resulting from tumor blockage of their ostia, or they may be secondarily invaded by tumor arising from the nose or nasopharynx. Posterior headache directed toward the occiput makes further investigation mandatory.

Various surgical procedures are necessary, both for obtaining tissue for diagnosis and for surgical treatment. The present trend is toward more radical surgical removal, followed by combined plastic operations and prostheses of eyes, nose, cheeks and dental plates, with obturators to shorten the period of physical and mental discomfort for patients so afflicted. Before extensive plastic procedures are instituted, the primary concern must be the treatment of the patient as a whole, with due consideration to eradication of the disease.

Certain tumors, such as malignant lymphomata and some types of adenocarcinoma, respond well to x-radiation. This type of therapy is often called upon to produce a cure when a cure is impossible, nevertheless it is frequently insisted on by the patient or his family. Such dilemmas of choice involve not only the original physician but the various consultants whom he may call upon for aid in handling the problem.

MOUTH AND PHARYNX

Very frequently local discomfort is a late symptom, and a tumor in the mouth or pharynx may have been present for several months before the patient seeks advice. In too many instances the patient is first seen with cervical node metastases. Earlier inspection would have revealed a lesion in the mouth, but few of us look at the edges or bases of our tongues as often as once in a decade.

Any lesion which does not heal promptly should be subjected to biopsy for

diagnosis. In the older age group poorly fitting and especially damaged dentures, and carious teeth with sharp snags, present a source of constant trauma. Their role in altering normal cellular differentiation has been and still is regarded as a predisposing factor in the genesis of carcinoma.

The most common site of malignancy of the tongue is the middle third of the lateral border. Following biopsy diagnosis, treatment by wide excision in trained hands usually produces excellent results. Suprahyoid or radical neck dissection in the presence of nodes on the homolateral side is a necessary adjunct. Lesions of the tip can often be removed by V excision. Lesions of the base may require large amounts of irradiation and subsequent radical neck dissection for control. As much as 17,000 roentgen units tumor dose may be required to treat lesions in this area adequately. Lesions which extend into the floor of the mouth and onto the alveolar margin are at present in a few centers being treated with combined radical neck dissection, hemiglossectomy and hemimandibulectomy in continuity—the "commando operation." Results of these procedures will be reported by other authors. Only with a team consisting of a qualified surgeon, internist, and anesthesiologist, and a trained resident and nursing staff is it feasible to carry on such extensive surgery.

Total glossectomies have been reported from a number of centers and offer in some instances the only chance for control of the lesion. Postoperative speech training forms an important part of rehabilitation.

In lesions involving the base of the tongue and lateral wall of the pharynx, even more tissue than in the commando procedure has been removed in some cases. Long range follow-ups are to be reported from the hospitals concerned.

In malignant tumors of the tonsil, the first manifestation is often a one-sided sore throat or a node in the neck. Biopsy establishes the diagnosis. Tumor is suspected if one tonsil is grossly larger than the other. Neck nodes may be nontender; or they may be slightly tender as a result of superimposed secondary infection. X-radiation is the treatment of choice at present and interstitial radiation for the cervical nodes has greatly improved the over-all results in these patients. A few far advanced cases have been treated by commando procedures but published reports are not yet generally available.

Involvement of the hard and soft palate may be primary, but on numerous occasions has been found to be secondary to sinus, nasal, or nasopharyngeal tumors. Radical surgery, with prosthesis when indicated, has given satisfactory results in some instances. X-radiation has been effectively used in others. Choice of method varies with the consultant's own clinical experience, especially whether his training has been confined to surgical or to radiologic approaches to the problem. Here again, a group opinion is most helpful.

LARYNX

Hoarseness is the most frequent symptom of malignancy of the larynx. When huskiness or hoarseness persists longer than two weeks, immediate steps should be taken to examine the larynx adequately by mirror laryngoscopy. If any suspicious abnormality is found, biopsy of the lesion should be carried out without

delay. So many patients relate the onset of hoarseness to a recent cold or upper respiratory infection that it fails to arouse suspicion and no medical advice is sought, but it is in this early period that treatment has its best chance of success. Many popular magazines have published articles in the past several years warning the public of the possible serious implications of allowing hoarseness to go unevaluated by their own physicians. The word cancer spells so much dread for those who have had personal family experience with it, that the cancer suspect makes his own diagnosis and delays careful examination. Many of these fearful persons are only borrowing trouble, for their hoarseness may prove to be on a nonmalignant basis. However, their uncertainty is communicated to other members of the family who, by personal pressure, help the patient finally to seek competent medical advice.

Fortunately the greater share of cancers involving the larynx occur on the vocal cords, and hoarseness is present early in the course of the disease. A sensation of a "lump in the throat" may be a symptom of cancer in other parts of the larynx; it occurs late in the disease and may be the only symptom noticed by the patient. Hoarseness in these instances occurs late also, and only when the extent of involvement affects the vocal cords themselves.

There is no substitute for thorough, complete, laryngoscopic examination. At present the number of general practitioners and internists who are qualified for such a procedure is very small and in most instances examination by a well trained specialist is necessary.

Dysphagia, respiratory obstruction, and hemorrhage are usually late manifestations and indicate the presence of advanced disease. Tracheotomy and control of hemorrhage are emergency procedures which must be executed adequately and promptly.

In addition to pathologic examination of the biopsy specimens and the information gained from laryngoscopy, further knowledge of the extent of the disease is necessary in order to determine the proper form of therapy. X-ray examination of the larynx by plane films, tomography, and the use of Lipiodol or barium swallow frequently helps to establish whether or not there is subglottic and postcricioid involvement. Chest films are a necessary part of this routine.

Therapy is designed to afford the best chance of ridding the patient of his disease. For early small localized lesions of the vocal cords, x-radiation or laryngofissure with surgical removal of the involved cord are the best forms of treatment. At present, more well trained surgeons are apparently available than radiologists thoroughly familiar with the techniques of examination and therapy directed specifically to this area.

One major difference in the results of the two types of treatment for a lesion of this extent without metastases is evident. The patient will probably have a clearer voice after radiation therapy than after surgery. However, since the chief concern is eradication of disease, this must of necessity be the major governing factor, and the advice to the patient will then depend on the physician's specific knowledge of the professional ability of the available consultants.

In the case of more extensive lesions, it is unfair to the radiologist to expect

him to do more than to treat the patient with the knowledge that radiation therapy in advanced malignancy of the larynx usually hastens rather than prevents the patient's demise. Nevertheless, under pressure from the patient and relatives, many cases are relegated to this type of so-called "solution" to the problem. The fear of operation and the patient's certainty that he will be totally unable to talk afterward, is taken as prima-facie evidence that no help is available. Total laryngectomy, in competent hands, with radical neck dissection for removal of all metastatic node-bearing areas and careful training in pharyngo-esophageal speech is available to the patient and must be given careful thought and consideration. The number of fully rehabilitated patients is constantly increasing, and the techniques for surgical removal and for teaching the new type of speech have improved so rapidly in the last five years that to be unaware of them is tragic.

With active members of "Lost Chord" Clubs working with patients both preoperatively and postoperatively, the rehabilitation time has been greatly reduced, and it is common experience to have the patient back at his former gainful occupation within two or three months time following surgery.

Many large medical centers are well equipped to handle these problem cases, and many smaller hospitals have recently added members to their staffs who have had exceptional training in this field. Careful evaluation on the part of the physician will quickly determine who should assist him in the care of the patient with a malignant tumor of the larynx.

SUMMARY

Symptoms suspicious of malignant growths of the ear, nose and throat have been reviewed. Guides to establishment of diagnosis and methods for eradication of the disease in patients in the older age group are described. The recent trend in establishing Tumor Clinics and Head-and-Neck Services, available for both private and service patients, is a valuable aid for the general practitioner and the geriatric specialist. A group opinion is frequently welcomed by both the patient and his family and the physician is relieved of sole responsibility for a decision which he often finds himself loath to assume, both by virtue of training and by preference.

BOOK REVIEW

Receipt of the following books received for review is hereby acknowledged. We are glad to publish complete listings of all new books received but such listing must be regarded as a sufficient return for the courtesy of the sender. Books of particular interest will be reviewed in full as time and space permit. Additional information in regard to all listed books will be gladly furnished upon request.

HOW TO HELP OLDER PEOPLE, by *Julietta K. Arthur*. Introduction by Wilma Donahue, Ph.D. Philadelphia, J. B. Lippincott Company, 1954, pp. 500. Price $4.95.

This useful guide for the average family is especially welcome at this time. It is a practical book for those who deal with older people in any way. It will help physicians to solve many problems dealing with the sociological care of the aging. It tells one where to go for help and advice, by states and cities, what older people want, diet, health, exercise and climate, preparation for change, community substitutes for home, old people's homes, care for the mentally ill, finances, and the relationships between different generations under one roof. The entire book is written in non-technical terms. It is a human document.

In another edition the author will probably include the truly remarkable work of Miss Frances King at the William I. Sirovich Day Center in New York City, and also the work being done at the Brooklyn Home and Hospital For the Aged. On page 478, the Journal of the American Geriatrics Society should be mentioned. It is owned by the American Geriatrics Society. This is the official journal of the Society and has been since January 1, 1953. There is still considerable confusion about the two Journals. It is impossible to cover every detail in a book; even the Bible has its errors.

M. W. T.

Books for review should be sent to Edward Henderson, M.D., Editor-in-Chief, 236 Midland Avenue, Montclair, New Jersey.

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